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The Southeastern Dead Sea Plain Expedition: An Interim Report of the 1977 Season

The Annual of the American Schools of Oriental Research

Volume 46

Edited by
Joseph A. Callaway

The Southeastern Dead Sea Plain Expedition: An Interim Report of the 1977 Season

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Edited by
Walter E. Rast and R. Thomas Schaub

Published by
American Schools of Oriental Research
with the financial assistance of the
Zion Research Foundation,
a nonsectarian foundation for the study of the
Bible and the history of the Christian Church

Distributed by
American Schools of Oriental Research
126 Inman St.
Cambridge, MA 02139

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American Schools of Oriental Research

Library of Congress Cataloging in Publication Data

The Southeastern Dead Sea plain expedition.

(The Annual of the American Schools of Oriental Research ; v. 46)
Includes bibliographies.
1. Ghawr (Jordan)—Antiquities. 2. Environmental archaeology. 3. Bronze age—Jordan. 4. Jordan—Antiquities. I. Rast, Walter E., 1930- . II. Schaub, R. Thomas, 1933- . III. Series: Annual of the American Schools of Oriental Research ; v. 46.
DS101.A45 vol. 46 [DS154.9.G48] 930s [933] 81-7909
ISBN 0-89757-046-4 AACR2

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Printed in the United States of America
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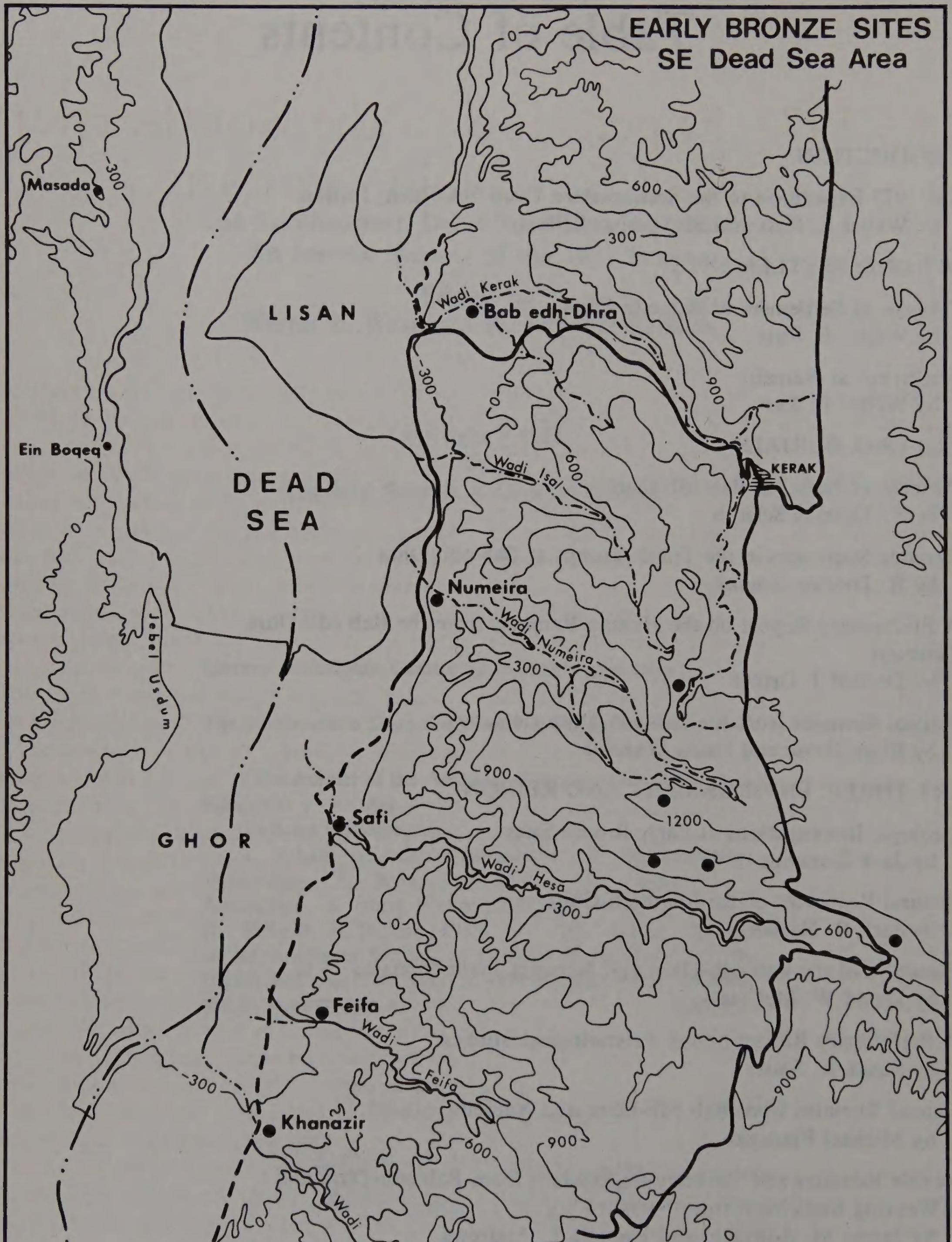

Fig. 1. Map of Dead Sea with southern Ghor sites.

Introduction

The 1977 Expedition to the Southeastern Dead Sea Plain, Jordan

WALTER E. RAST and R. THOMAS SCHAUB

The second season of the new excavations at EB sites along the southern Ghor in Jordan (Rast and Schaub 1978: 1-31) was conducted between 23 May and 6 July 1977 under the auspices of the American Center of Oriental Research in Amman in cooperation with the Department of Antiquities of Jordan.[1] Since the results of this season were of particular significance, and since only a small amount of publication has yet appeared on the work in the southern Ghor, it seemed appropriate to produce a larger interim report on the expedition's results thus far. This series of articles consequently attempts both to present some of the materials of the 1977 season and to discuss their significance in a provisional way for the goals of the project. The essays are grouped in three sections entitled: Settlements, Burials (including a selection of pottery from the tombs), and Environment and Region. The present chapter discusses basic problems upon which the expedition has focused and the way in which the southern Ghor project is being conceived as an integrated, interdisciplinary approach to the various problems in this isolated region along the Dead Sea.

Interdisciplinary Studies

A principal objective of the southern Ghor expedition is a multidisciplinary investigation of this marginal area bordering the Dead Sea (fig. 1). Although such an approach is not unique to the southern Ghor expedition, the isolated southeastern Dead Sea basin offers an unusual opportunity to employ different specializations in the study of the region.

A cross-disciplinary study of the area evolved from the recognition that the problems of the southern Ghor and its EB settlements and populations could not be comprehended by a staff limited to traditional means of inquiry. The expedition is attempting to answer questions which challenge a variety of expertises. They include the following: changes in settlement patterns during the different phases of the Early Bronze Age; agricultural practices and technologies of the EB inhabitants; sizes and interrelations of the population groups of the sites in the southern Ghor during the several phases; diet and disease factors among the populations; evidence for trade contacts with nearby and more distant areas; and a variety of environmental problems focused on natural resources, land forms, and climate during the third millennium B.C.

During the 1977 season the interaction of the disciplines occurred not only in the surveys but also in the investigation of the settlement areas and the tombs. The tombs became one focus because they were often excellently preserved, containing plentiful cultural and human remains. Variation in the disposition of burials received attention, as did the special ceramics and objects deposited with the human remains. The human skeletal remains called for a different set of analyses, and the fact that food remains were attested in several vessels fixed the tombs into larger environmental investigations. Pollen gathering was undertaken in several of the tombs, while the geologic examination of individual tombs related them to the profile of the cemetery site and the larger Bab edh-Dhra region. Also important were analyses of the sources of stone objects in the tombs, as well as the technical features of the pottery and mudbricks used in the mudbrick structures established for burial. Each of the investigations usually generated questions important for other aspects of the research so that staff members found themselves in frequent interchange on the common problems. Similar kinds of staff interaction occurred in connection with the two town sites under investigation as well as in the regional surveys.

Environmental Studies

The ecological investigation of the southern Ghor is a natural aspect of the work, given the extraordinary climate and terrain of this area. The expedition began with the assumption that it is more proper to conceive of environments as bearing on the life of the EB people rather than the singular of the term. Using a subsistence and perception model for prehistoric land use proposed by Karl W. Butzer (personal communication, 1976) and adapted to the conditions of the Early Bronze Age, a distinction was made between geographical, operational, modified, and perceived environments with their varying impacts upon the ancient peoples. According to the model, the *geographical* environment encompassed the ecosystem of the southern Ghor, upon whose constancy the EB occupants were dependent. The *operational* environment included the perimeters of the subsistence territories, raising questions of the relation of the Ghor inhabitants to the Jordan highlands and even more distant areas for necessary items. The *modified* environment was that upon which the EB peoples laid their hands and which they altered through their technologies and agriculture. Finally, the *perceived* environment was that combination of natural features of which the ancient peoples were aware and on whose basis they chose or were forced to make critical decisions regarding settlement in the area, including at times also the problem of the termination of their settlements.

Through the data-gathering of Donahue, Harlan and Short especially (see below, pp. 137-54, 155-64, 171-75), some solutions to the interactions of the ancient populations with these various environments have become possible initially and tentatively. The features of the geographical environment are most likely to be reflected in the pollen studies, through the examination of the resources of the Ghors, and by the geologic investigations. None of those examining these aspects is yet ready to commit himself or herself on the crucial question of annual rainfall during the Early Bronze Age. There is some small evidence pointing in that direction, but the difference between annual rainfall in antiquity and recent times apparently was not substantial and, thus, is difficult to trace.

Both Harlan's survey data from the southern Ghors and the samples processed by McCreery through flotation (see below pp. 165-69) suggest an operational environment comprising a more extended territory than the southern Ghor even though, as Harlan concludes, the southern valley area possessed the requisite conditions for a sizable population during antiquity. Evidence gathered during 1977 included food items pointing to the Jordan plateau area to the east or the hill country of Palestine beyond the Dead Sea. Judging from Harlan's search for clues in the natural resources, it seems that the occcupants of the southern Ghor had contact with the highlands on either side of the Dead Sea during all phases of the Early Bronze Age. Operationally, therefore, the EB inhabitants were linked to a mode of subsistence comprising also these areas. The follow-up on data recovered during 1977 should focus this picture more precisely. The problems are difficult, and they call for further exploration in the Ghor and the peripheral areas. Beyond that they assume data from the adjacent areas of the Jordanian plateau which unfortunately at this point are extremely scarce. Future exploration at EB sites on the plateau could do much to clarify such connections.

That the EB settlers modified their environment is clear from a variety of evidences in the excavated plots and from data gathered by the surveys. A striking feature discovered during the 1977 season was the large amount of wood used by the EB town peoples at both Bab edh-Dhra and Numeira. By contrast little evidence of wood appeared in the debris of either the EB IA or EB IB peoples. Carbonized remains in the towns of Bab edh-Dhra and Numeira, representing medium-sized and often larger beams, were from trees probably felled nearby or on the slopes above the sites. Such activity seems to have become particularly intense during the period of the walled towns of EB II and III. This evidence from excavation in the settlement areas complements the observations of Harlan (see below, pp. 160-64) that the present treeless environment of the southern Ghor is not simply the outcome of natural conditions, but that human beings have been responsible as well for the changes which have occurred from antiquity down to the present. The conditions of the EB period in the southern Ghor are similar to those at Jericho, where the period of the town (EB II-III) in particular was one during which widespread felling of timber occurred, a development which left a lasting imprint upon the landscape (Kenyon 1960: 3).

In other ways the EB people exploited resources immediately available. Their manipulation of water supplies is difficult to ascertain. But one of their important activities, no doubt, concerned channeling spring discharge and runoff in the direction of cultivable lands, as did peoples later in the Byzantine period. The correspondences between Harlan's study of water sources in the wadis of the southern Ghor and the numerous blades and mortars identified in the excavated plots and on the survey attest a dominant cereal economy which assumed some type of irrigation system. For their building projects the EB peoples reached to the surroundings for assistance, making the most of plentiful stone supplies on the slopes to the east and in the wadis next to both sites. Concomitantly, they experimented with different styles in the manufacture of mudbrick, changing the material from which the bricks were made at different periods. The surveys of Donahue concentrating on stone sources and Johnston on identifying clay beds are establishing a valuable basis for understanding this aspect of the modified environment.

During two phases in particular the environment as perceived by the EB people became important. The first involved conditions which moved them to establish a permanent settlement at Bab edh-Dhra and to choose Numeira for a related occupation during EB III. The picture is not yet complete, but it seems that the settlers must have experienced an environment which invited them initially to remain for extended periods and, in the course of time, to establish a walled town. The contingencies involved would have included availability of water, soils rich enough to promise a good crop, and an elevated location for adequate defense. The isolated nature of the area no doubt was also perceived as advantageous. These are general statements, but it can be expected that with continued study of specific data the environmental determinants present in the transition from nonsettled use of the site in the earliest phase to the first permanent settlement slightly later will become clearer.

A second phase for which the perceived environment becomes important focuses attention on the end of EB occupation in the southern Ghor. At Bab edh-Dhra this occurred during EB IV while at Numeira it was late in EB III. What the situation was at other EB sites in the Ghor remains to be seen. The termination of EB III settlements at both sites, it seems, was occasioned by attacks against these citadels. But the conditions which finally brought about the end of the later EB IV settlement at Bab edh-Dhra, probably around 2200 B.C., are debatable. It is doubtful that external assault was the main force at work since so little in the way of evidence points in this direction. Rather it seems that the remnant population of EB IV assessed increasing limitations in the resources of the area and responded accordingly, perhaps moving elsewhere and abandoning the region.

Continued work on this problem in the future will test the impact of possible environmental changes on the EB IV population. Such questions as the following become important: Did the occupants leave in the face of specific climate changes which threatened to upset the delicate balance of the southern Ghor? Did prolonged use of the limited resources of land and water result in salinated soils and the breakdown of the carrying capacity of the region? Was overgrazing a contributor to environmental change? Did unrestricted cutting of limited timber reserves during EB II-III transform the area from a once more luxuriant region into a disaster zone? Were the effects of the earlier destruction of the EB III settlements so environmentally devastating that the survivors of these towns found it impossible to reconstitute themselves, or were the EB III peoples represented among the succeeding EB IV population? Whatever changes occurred, a perceiving population reacted to them and was thus forced to make adjustments in its life patterns.

Regional Investigation

A third distinguishing feature of the expedition is its regional aspect. During 1977 it was possible to put into action the regional goals of the expedition. Two features in the southern Ghor favor such an approach to the data. One is the natural demarcation of the territory to be investigated. The southern Ghor is an area stretching alongside the southeastern coast of the Dead Sea from the northern edge of the Lisan to the extreme south where it is separated from the Arabah by a ridge of marl hills and cliffs. Bounded on all sides by natural barriers, the southern Ghor is thus a self-contained terrain. The archeological remains at the cultural sites of the area suggest that the region was always a unit whenever it was in relatively heavy use, as it is today.

A second feature is that we are not dealing with several isolated occupations but rather with a series of EB settlements which were apparently related (Rast and Schaub 1974: 19). In respect to political, economic, and social-cultural interchange, the investigations made at Numeira during 1977 highlight this aspect and begin to raise the question of the relation of the population of that site to Bab edh-Dhra. In the future each of the several sites is slated for independent examination, but each will also be studied as a component within this regional system.

During the 1977 season the opportunity to put into the field the wider surveys of the southern Ghor also gave impetus to this regional goal. The results are promising, as can be seen in the articles included in this volume which concentrate on the areas around Bab edh-Dhra and Numeira. Eventually the expedition hopes to fill out the picture by surveys in the es-Safi, Feifeh, and Khanazir areas, along with the excavation plans. These aims lie ahead of us, but as they are pursued the staff is devoted to maintaining an integrated perspective, insured by the regional goals of the expedition. The present volume, then, is a preliminary report of the work in 1977 and, at the same time, a provisional effort to connect the data thus far recovered with the fundamental problems providing the rationale for the expedition. Complete discussion must be withheld, however, until the results can be presented more fully in the final publication. Work continues on the latter even as this study is being issued. It is a priority of the staff that the full evidence will be made available as readily and completely as possible.

NOTE

[1] The expedition was supported by contributions from the following donors: Mr. J. B. Armstrong, Mr. and Mrs. Mabon Childs, the Dynac Corporation, Mr. Henry L. Hillman, Col. and Mrs. Floyd M. Johnson, the Kyle-Kelso Fund, the Kyle-Kelso Excavation Fund, Mr. and Mrs. Walter R. Ramshaw, Mr. Fred Reddel, Sr., Mrs. George D. Smith, and Mrs. Bettye Youngjohn. The National Endowment for the Humanities gave its backing with matching funds (RO 26177-77-413) against the contributions from those listed above. In addition, the Smithsonian Institution Research Awards Program underwrote the costs of a new exploration of shaft tombs in the cemetery, coordinated by Donald J. Ortner. The offer of the Department of Antiquities of Jordan to assume the salaries of a portion of local workers helped both to counteract the problem of inflation in Jordan and to make possible the deployment of a larger labor force than originally planned. The expedition is grateful to each of these individuals and institutions for their support. It also wishes to record its special thanks to Dr. Adnan Hadidi, Director-General of Antiquities, Dr. James A. Sauer, Director of the American Center of Oriental Research, and Dr. Edward F. Campbell, Jr., Vice-President of the American Schools of Oriental Research.

The staff of 1977 consisted of 42 people from the United States, 1 from Canada, and 1 from Sweden. Codirectors were once again Walter E. Rast, Valparaiso University, and R. Thomas Schaub, Indiana University of Pennsylvania. Special research staff included Jack Donahue (geologist, University of Pittsburgh), Michael Finnegan (physical anthropologist, Kansas State University), Jack Harlan (paleoagronomist, University of Illinois), Robert H. Johnston (ceramicist, Rochester Institute of Technology), Donald J. Ortner (physical anthropologist, Smithsonian Institution), Susan Short, (palynologist, University of Colorado), and Mark McConaughy (lithics, University of Pittsburgh). Photographers were Christine Helms (Oxford University) in the city areas of Bab edh-Dhra and Numeira and Kjell Sandved (Smithsonian Institution) in the cemetery of Bab edh-Dhra.

Field supervisors were Alberic Culhane (St. John's University, MN), James Engle (Pittsburgh Theological Seminary), Jack Graham (Atlanta, GA), Dorothy Hill (Walters Art Gallery), John R. Lee (St. John Fisher College, NY), Mark McConaughy (University of Pittsburgh), David McCreery (University of Pittsburgh and Pittsburgh Theological Seminary), and Burton McDonald (St. Francis Xavier University, Nova Scotia). Names of square and tomb supervisors will be listed in the final volumes. These included 15 participants from Harvard University, the University of Kansas, Kansas State University, St. John's University (MN), Valparaiso University, Duquesne University, and Pittsburgh Theological Seminary. Four volunteers also were from Virginia, California, Missouri, and Sweden.

Other responsibilities were handled by Jeffrey Raday (surveying), Jeannine Schonta (surveying and cartography), Jennifer Loynd (drafting), Rebecca Unland (drafting), Janine Dragan (registration), and Linda McCreery (pottery). Marilyn Schaub was in charge of camp organization and served as chief registrar. Joyce Ortner supervised the preservation and packing of skeletal remains.

Participants from Jordan were Sami Rabadi of Kerak and Husni Yusuf Abu Shwaimeh of Amman, both as representatives of the Department of Antiquities. Technical men were Yahya

Darwish of Sebastiya and Muhammed Darwish, Sadik Abdullah, Khamis Fahed, Ayish Muhammad Issa, and Ali Khalaf, all of Amman. Cooks were Muhammad Khalil Karaeen and Abul Abed, both of Amman. The working force consisted of approximately 90 laborers from the settlements of el-Mazra, Haditha, and es-Safi.

The expedition was based at Kerak where a camp was organized at the castle by arrangement with the Department of Antiquities. Several rooms of the castle were employed for photography, processing, and registration, while a flotation operation was set up next to a water supply at the castle. The expedition screened off a large hall of the castle to serve as a kitchen and dining hall. Makeshift showering facilities also were devised with a drainage system leading water outside to protect against deteriorating effects on the castle. Several rooms of the adjoining Kerak Rest House were rented and were used to house some of the staff as well as for storage and processing.

The arrangements at Kerak, a half hour away from Bab edh-Dhra, were ideal to allow the staff to recover from the heat of the Ghor, which often becomes intense by early summer. Transportation between Kerak and the site was accomplished with a fleet of minibuses from Kerak. Work began at sunrise, continuing until noon when the staff returned to Kerak. Following a rest period, pottery reading, photography, object registration, flotation, and other processing activities were carried on at Kerak. After the first week one or two of the vehicles of the expedition made a daily return trip to the Ghor late in the afternoon for additional work on planning, balk drawing, and geological investigation.

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Part One: Settlements

Patterns of Settlement at Bab edh-Dhra

WALTER E. RAST

EB IA Usage of the Site (Areas H1 and H3)

Evidence is increasing in favor of the view that permanent settlement at Bab edh-Dhra began in EB IB, indicating that use of the site during EB IA was temporary and perhaps seasonal. What settlement evidence is present for EB IA points to intermittent visits to the site. This feature was observed in the earlier excavations of Lapp (Lapp 1970: 109), but the results of the recent seasons, and especially those of 1977, have put in sharper relief the nature of EB IA use of the site.

Affecting this reconstruction was a discovery in the cemetery during 1977 of an area containing much broken pottery and some animal bones, which were apparently thrown down a slope, making the area a place for refuse. Several such layers of strewn pottery and gravel were discovered on the northern ridge of the cemetery, northwest of the complex of charnel houses. Designated as Area H, it was encountered at the beginning of the season during the search for shaft tombs. In one of the trenches laid out in a search for the lines of EB IA shaft tombs, a series of burn layers turned up. This seemed to indicate that the area had been used in connection with some type of settlement rather than burial. Two of the trenches (H1 and H3) in Area H were located on the crest of the northern ridge, 1 m south of the steep slope to the north.

The nature of the H1 and H3 remains can be seen in the drawing of the balk (fig. 1). The trenches contained a series of layers sloping from northeast to southwest. Several of the layers (Loci 13, 14, and 19) had numerous pebbles and small cobblestones mixed with heavy accumulations of pottery and bones. These were interlaced with layers of brown or ashy gray soil. In one of the latter (Locus 18) a peach stone was recorded. This was the second such find of the season, another having been discovered adjacent to the bone pile in EB IA Tomb A 91.

No evidence appeared in H1 and H3 of structures associated with this midden. At the east end of H1, however, a mound of decomposed mudbrick may have been the remains of quarters associated with it. It is likely that the refuse was left by campers who settled for a time on the ridge of this area. It is also possible that the heap of pottery fragments may have been from a pottery-making industry nearby, although the mixture of animal bones is evidence against this.

The pottery from H1 and H3 is a new and important discovery. According to field readings, the pottery belonged to the EB IA phase. Many of the broken fragments were from holemouth cooking vessels, as well as jars and bowls. Exterior decorative features such as stippling with a reed were commonly found around the necks of jars or on the shoulders of bowls. These are exactly the features which appear on the same types of vessels from the EB IA shaft tombs at Bab edh-Dhra. Especially noteworthy was that the pottery from H1 and H3 had been made of coarser ware than the finely levigated wares of the shaft tombs, suggesting that these fragments might have been from domestic counterparts of the tomb pottery. It remains to be seen in postseason study of these objects whether they are to be assigned to any particular phase of EB IA. The presence of one or two forms approaching EB IB types seems to suggest the latter part of EB IA.

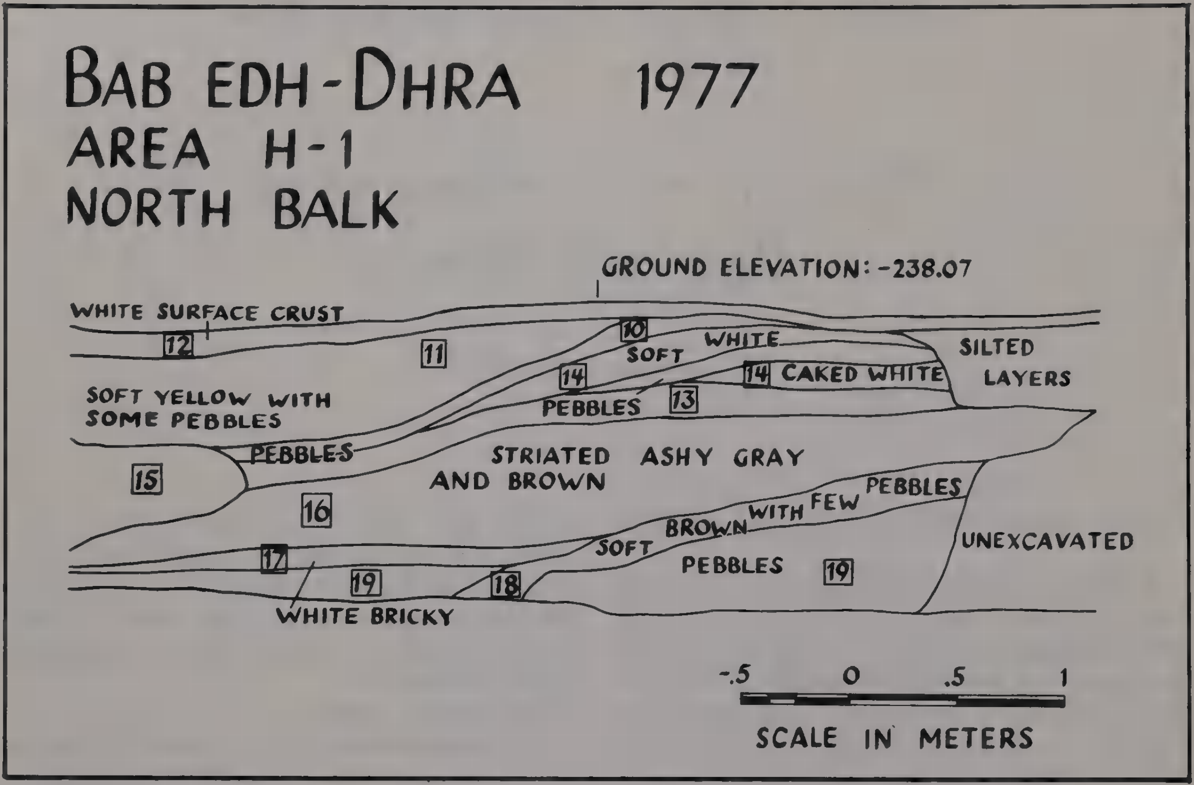


Fig. 1. Drawn section of balk in H1.

In Areas H2 and H4, which lie southeast of H1 and H3, a different situation was encountered. Here were remains of stone and mudbrick walls. The mudbricks were in some cases laid parallel to stone walls, and at times were placed on a lower course of stones. The bricks were well-made, usually rectangular in shape, measuring an average of 40 × 30 × 9 cm. Although the walls were substantial, they were fragmentary, and no definitive shapes of structures could be determined. More problematic was the lack of occupational layers and sherds. Thus, although it is tempting to associate these walls with the EB IA material in H1 and H3, they could relate to any period of the Early Bronze Age and may indeed reflect operations during the period of the charnel houses associated with EB II-III. At this point these remains do not offer conclusive evidence for determining the features of EB IA occupation.

A further area of importance for this earliest phase at the site was Area F. During the 1975 season several EB IA shaft tombs were discovered west of the western defensive wall of the town (Rast and Schaub 1978: 5-7). The follow-up in 1977 in Area F brought to light evidence for sedentary occupation during EB IB. On the other hand, no evidence of any kind of settlement during EB IA appeared. Rather, the EB IA people seem to have used the western marl slopes of Area F exclusively for their shaft tombs, as found in Tombs F1 and F2 in Area F of the 1975 season. Following this the EB IB occupants put the area to a new use by establishing their settlements over the earlier tombs. Apparently they were not aware that the area had been used for burial by their predecessors. It seems that the EB IB remains found above Tomb F1 during the 1975 season (Rast and Schaub 1978: 5) may have been from occupational use rather than tombs.

These results consequently make it possible to clarify some of the settlement evidence discovered previously during 1975 and also earlier by Lapp (Rast and Schaub 1978: 6-7; Lapp 1970: 109). The sparsity of occupational remains dating to EB IA can best be explained if settlement at the site during EB IA is viewed as having been transient. The EB IA peoples at Bab edh-Dhra would thus have been in the early part of the phase, at least, a wandering folk. The designation "pastoral nomads," employed in several contexts by Palestinian archeologists, seems an apt term for their way of life. The most apparent evidence they left behind was the series of underground shaft and chamber tombs, but without a settlement architecture comparable to the tombs they cut.

These fragments of occupational data can be placed next to the tomb evidence from EB IA (see pp. 45-68; 119-32 below). The unique feature of the EB IA tombs is the consistently disarticulated bone pile. The placement differs, however, from the often jumbled human bone remains from the later EB II-III charnel houses. The neatly stacked arrangements of human remains and grave goods of the EB IA shaft tombs were evidently the work of a people returning periodically with their dead from elsewhere, perhaps at a particular season of the year. The disarticulation of their burials is different, however, from that of the EB II and III tombs which, it now seems evident, was caused by the successive displacement of originally primary burials. This distinction between the burials of the two periods was noted by Lapp (1970: 107), but its importance for understanding the evolution of settlement at the site has increased as a greater amount of settlement and tomb data has come to light.

It is always possible that evidence for a more permanent occupation during EB IA may yet appear, although at this point it seems doubtful. Rather, the present study of several independent lines of evidence among the contents of the shaft tombs seems to substantiate a hypothesis that the EB IA people were related to a subsistence environment which led them to relatively great distances from the Bab edh-Dhra site. Concomitantly their appearance at the latter was occasional until the end of EB IA, when the presence of articulated burials in the latest EB IA phase suggests a more extended dependency on the site. The settlement discoveries in Areas H and F are important evidence for such an interpretation.

Beginnings of Permanent Settlement in EB IB (Area F4, Fields XII and XIII)

The EB IB phase of Bab edh-Dhra is well attested by means of its mortuary traditions and settlement remains. Substantial changes in the sociocultural and burial patterns are evident during this phase as over against EB IA. Indeed, as has been noted, it is to this phase that the beginnings of year-round settlement at the site can be attributed.

Although it will take a future season of work in all three areas to expose the picture fully, it appears as a result of the 1977 season that a basal EB IB occupation is found in Area F, as well as in Fields XII and XIII. Area F4 was a 5 × 5-m square laid out to the east of Tomb F3 of the 1975 season, over an area which had been disturbed by local tomb robbers searching for shaft tombs (fig. 2). The small section excavated revealed valuable information regarding the settlement history of the site.

In the first place there appeared to be no clear evidence for settlement in this area during EB IA (Rast and Schaub 1978: 5-6). Rather, as noted previously, the EB IA folk used the slopes for cutting several of their shaft tombs. When the EB IB people began to settle along this western shelf, they were forced to modify the marl slopes by leveling the area for occupation. In this area a series of ashy occupational layers (Loci 21, 41A) was deposited by inhabitants of this phase (fig. 3). In the layers were numerous sherds, some with clusters of painted lines (line-group painting) typical of EB IB decoration.

The work did not establish whether these occupational surfaces abutted structural remains to the south. Wall 63 was found in this area, but since the wall had been built into the ashy layers it seems to have belonged to the later EB II-III extramural occupation of the period of the town. Supporting this was evidence that the mudbricks of Wall 63 were rectangular in shape and made from clay and tempering material like bricks found in the town. It is probable that the wall discovered in 1975 to the west, plastered to a benching in the marl, was also part of this same EB II-III occupation (Rast and Schaub 1978: 7, fig. 5). Thus although no walls have been found associated with occupation layers, the depth of the EB IB layers suggests that the settlement here continued for substantial periods of time. It does not seem that the area is to be earmarked simply as a camping site. The indications are of longer-ranging occupation, and the proximity to the soon-to-evolve EB II-III city suggests an early phase of what became urbanized organization at Bab edh-Dhra.

Substantial EB IB remains appeared also in Fields XIII and XII. In Field XIII.2 an east-west wall made of rectangular mudbricks (Wall 38)

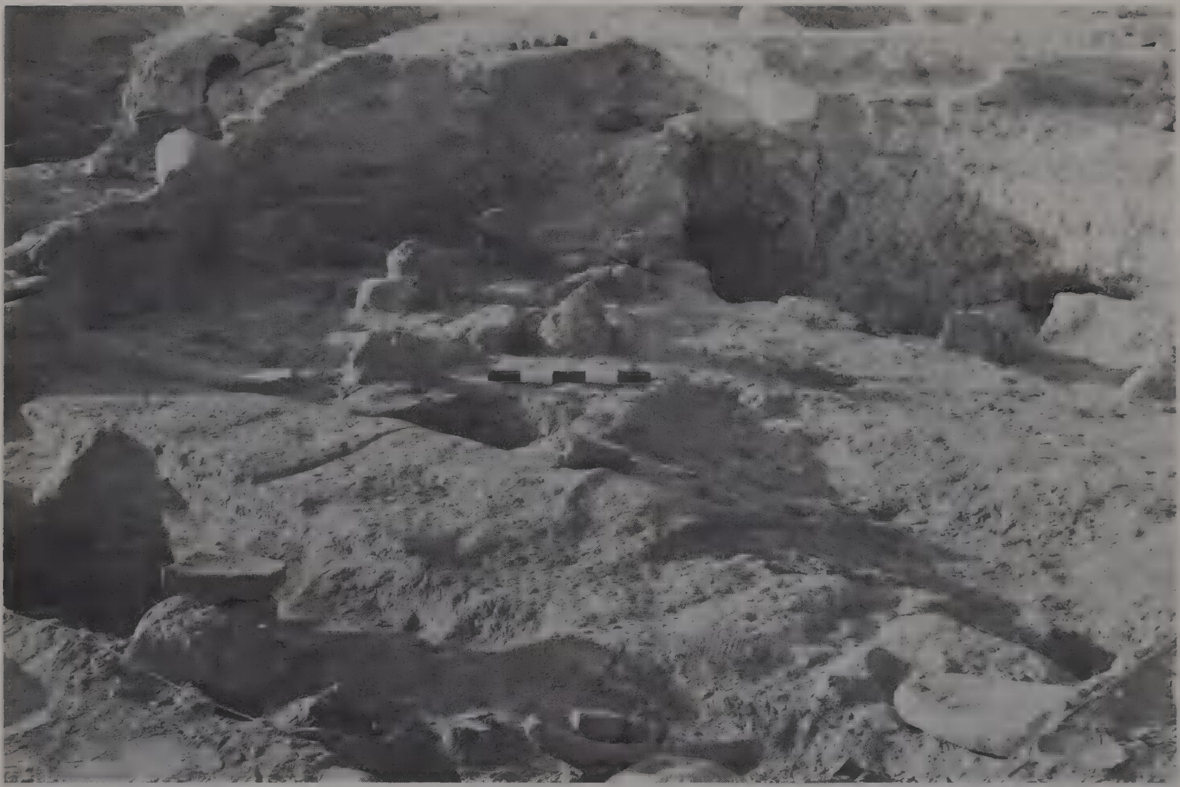


Fig. 2. General view of Area F showing EB IA tombs cut into slopes in the background.

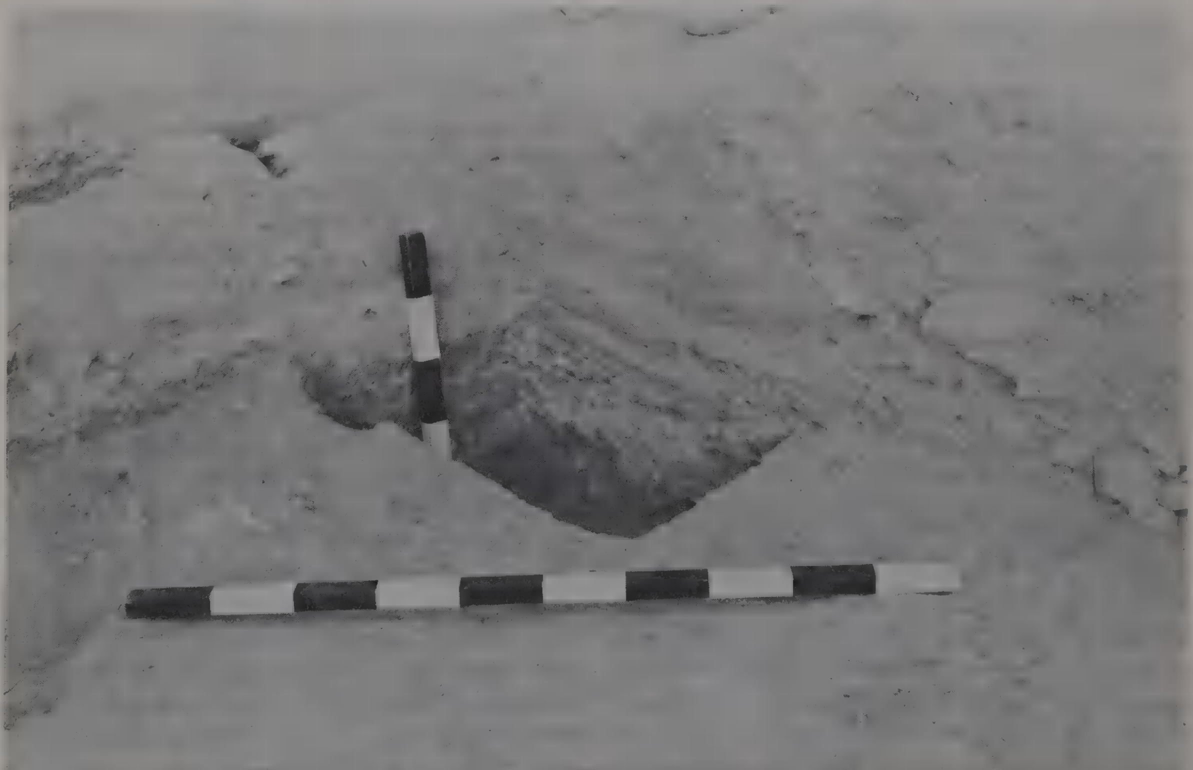


Fig. 3. EB IB occupation layers (Loci 21, 41A) in section in F4. Note EB II-III mudbrick wall above.

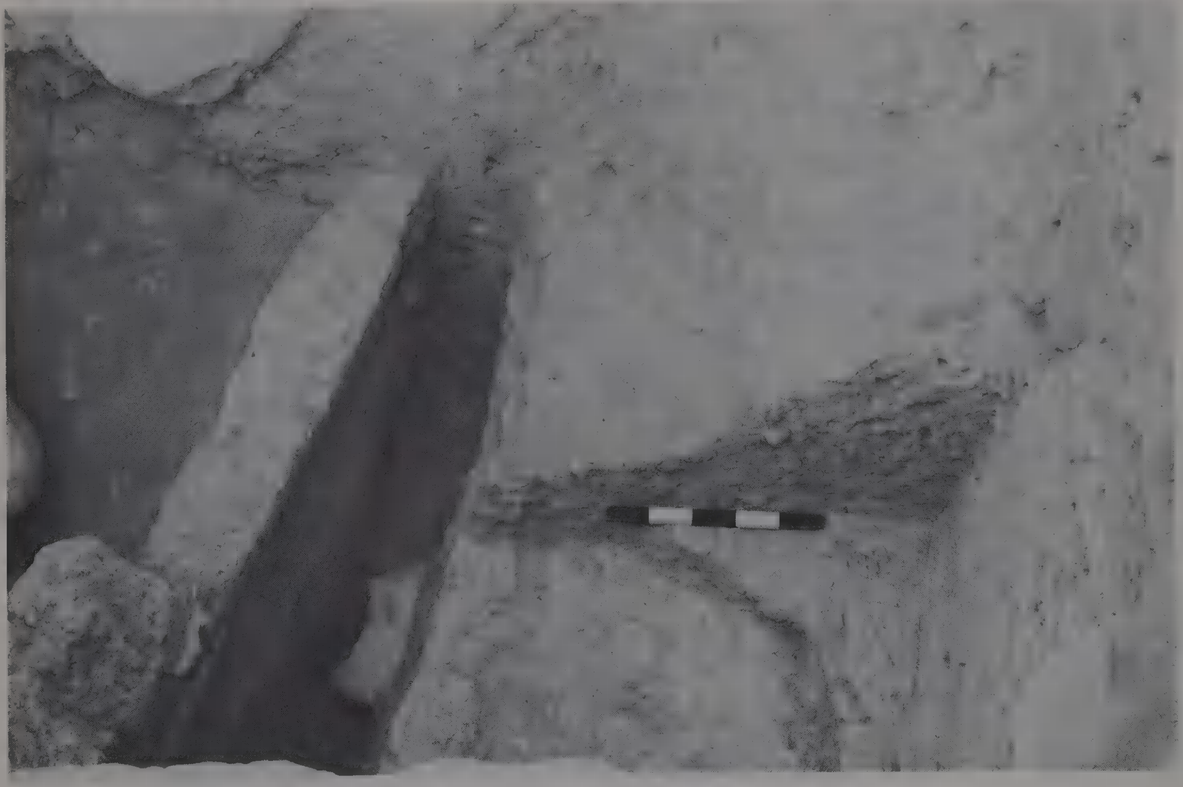
came to light during the 1977 season in the lowest part of the square, below the EB II-III remains of the town wall (fig. 4). Ashy layers abutting this wall (Locus 39) produced pottery of EB IB type. The bricks of Wall 38 were also interesting. A study of mudbrick types at the site indicates that the EB II-III people used a greater amount of temper in their bricks and that they were made from several types of clay, whereas the earlier bricks of EB IB used cream white or green *huwwar* with very little temper added. The bricks of Wall 38 were of the latter type, contrasting with the numerous bricks from the town period found in this area.

Paralleling Field XIII evidence were mudbrick remains discovered below the broadroom structure of EB II-III in Field XII. In three of the squares of Field XII (4, 5, 7) the lower levels of Early Bronze were reached, and in all three a wall of rectangular mudbricks appeared. Pottery associated with the walls in all three cases dated them to EB IB. It is possible that the walls were related as parts of a larger structure or complex of structures beneath and adjacent to the broadroom building. The small amount of wall appearing in Field XII.4 (Locus 12) is almost exactly perpendicular to the mudbrick wall (Locus 7) in the northern half of XII.7, although these two are some 20 m distant from each other (figs. 5, 21).

The evidence for EB IB in the town coincides with data brought to light in the earlier excavations at the town site in 1965. In Fields I and II at the extreme east end of the town site, several layers appeared at the bottom of the trenches which subsequent study has shown to date to EB IB. The evidence for this period has consequently appeared in enough areas below the main EB II-III city to establish it as an important phase.

The picture emerging, then, is that permanent occupation at Bab edh-Dhra began with an early experimental settlement during EB IB, and that this evolved into the city of EB II-III with its elaborate walled system and building complexes. Although this settlement apparently was not encompassed by a defensive system, the occupation of EB IB was spread across what later became the area of the walled town. The occupational debris associated with the walls of EB IB dwellings thus

Fig. 4. EB IB Wall 38 in Field XIII.

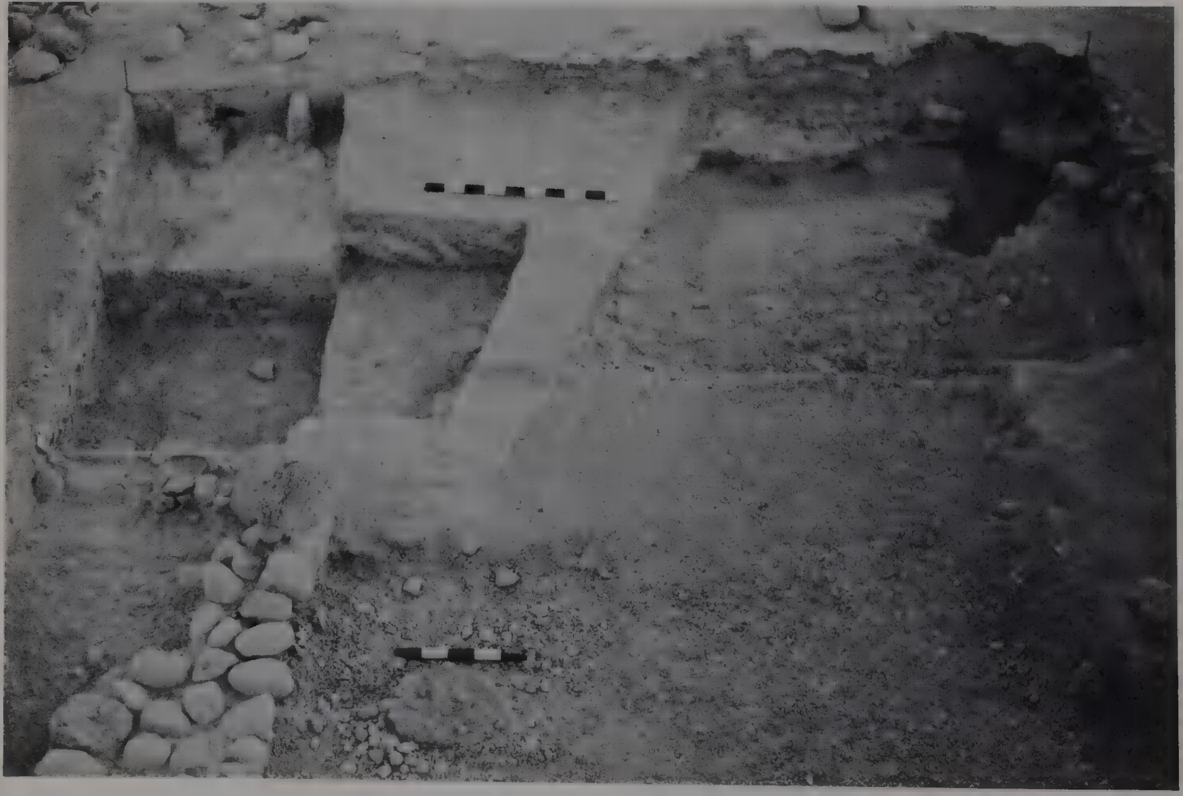


far discovered suggests that people remained at the site on a permanent basis rather than returning to it from elsewhere for brief visits.

As in the case of EB IA remains these settlement finds of EB IB need to be placed over against the EB IB tombs to see the interlocking of the two sets of data. When taken together they correlate significantly. The most marked characteristic of the EB IB tomb tradition is the innovation of partially above-ground mortuary structures made of mudbrick, as in the case of Tomb A53 excavated during 1967, and G1 cleared during the 1977 season (see pp. 45-68 below). In these two cases the disposition of burials in EB IB diverged from the usual practice of disarticulated burial practiced in EB IA. During EB IB primary burial became the prominent feature, as is the case in the early EB IB shaft Tomb A100N, as well as in the round funerary buildings. In the round buildings as well, the first evidence of successive burial and in-tomb dismemberment and reorientation of earlier remains is found. The EB IB people buried their dead in these tombs immediately after death. It is noteworthy that this feature was anticipated in the latest EB IA tombs, such as G4, and in other examples which have been excavated previously. It should be noted, however, that the custom of arranging secondary bone piles persisted in occasional EB IB tombs, such as A43 excavated in 1965, and A88L excavated during 1977. These examples exhibit the relationship the EB IB peoples had to their immediate predecessors.

The funerary buildings of EB IB also suggest communal burials in contrast to the earlier shaft tomb burials, whose arrangement, number, and limited variety of persons suggest family or clan entombment. New pressures of growing population density are suggested by the EB IB burial practices. These would seem to be a corollary of year-round settlement at the site, which made necessary the adaptation to an environment put under greater strain. The consignment of tracts of land to cultivation to support year-round settlement also affected the available land for tomb cutting, encouraging the use of larger, communal tombs. This picture needs to be scrutinized by securing further data from the town area, to be sought in a future season. It is also being tested by

Fig. 5. EB IB Wall 7 in Field XII.7, looking N: Wall 12 to left.



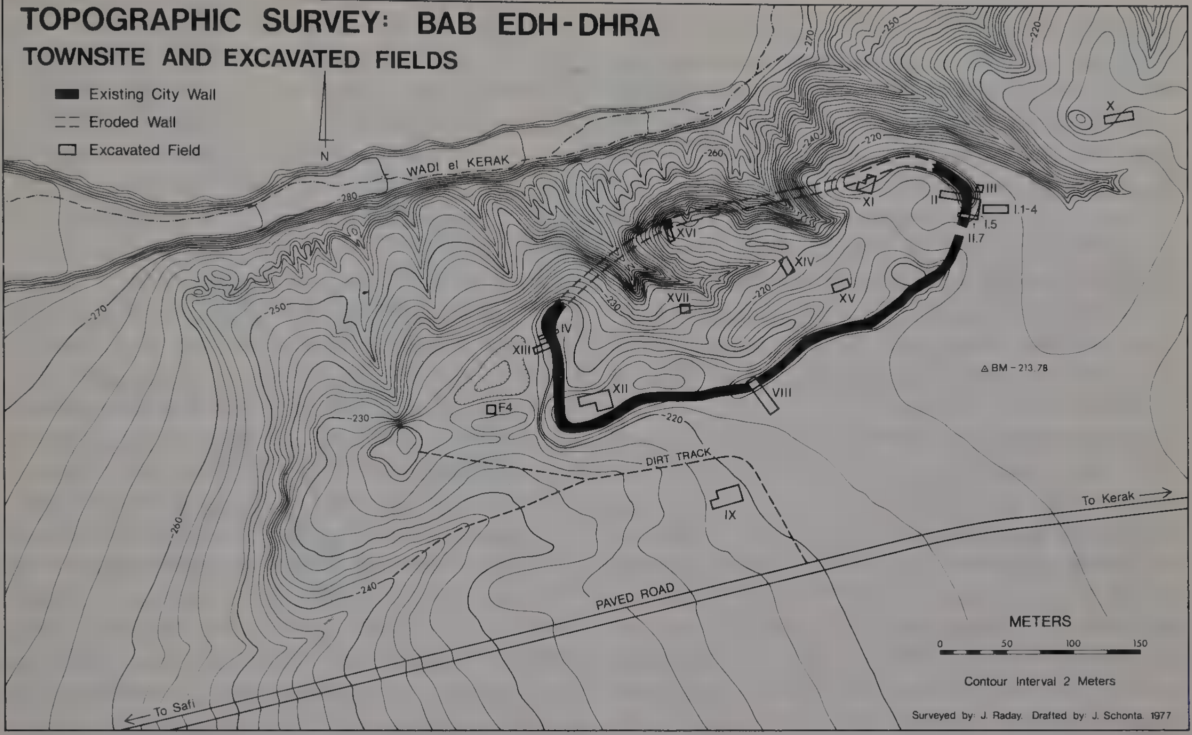


Fig. 6. Topographic map of Bab edh-Dhra.

the study of several sets of variables within the EB IB tombs themselves.

The City of EB II-III

Exploration of the walled city of Bab edh-Dhra has become one of the major foci of the excavation plans of the expedition. The expedition hopes to be successful in respect to two goals. First, it is anticipated that vertical cuts in a number of fields containing a well-preserved depth of cultural remains will establish the several phases of the town's history during EB II-III. Second, the expedition aims to determine the use of different spaces within the town as a means of comprehending the ways in which the EB II-III people organized themselves in an urban arrangement. It should be noted that the town site has previously been frustrating in regard to both of these goals. Severe erosion, especially on the north side but also across much of the higher area within the town itself, has frustrated attempts to obtain a substantial vertical or horizontal picture.

A look at the new topographical map of the walled town (fig. 6) made during 1977 shows how precarious the situation is on the north side. Two erosional incisions have resulted from the active Wadi Kerak, claiming substantial sections of the bluff on which the town is situated. This erosion activity was a major factor in obscuring the nature of the site to earlier explorers. Thus several earlier interpretations applied to the town viewed it more as an enclosure rather than as a true urban concentration (Albright 1926: 61-62; cf. Lapp 1968: 4-5). Several areas within the town which have been sampled by excavation, including those explored by Lapp, have not turned up a well-preserved depth of occupation, since earlier excavations undertaken in the interior of the city tended to produce only a few, shallow remains (Rast and Schaub 1978: 31). Field XV of the 1977 season encountered the same dilemma. Only against the defensive wall on the west and east (Fields I, II, and XIII) and in Field XI on the northeast was some depth of cultural debris reached prior to 1977.

The 1977 season has wholly altered this perspective. The field strategy of the 1977 season at Bab edh-Dhra was to examine, by combining excavation and geological survey, the nature of the interior of the city. Excavation plans included expansion of several fields which had been begun in 1975, as well as opening several strategically positioned new fields. Alongside this the assistance of the geologist was sought in determining features of the site's erosion. If the site were mostly washed out, it should at least be possible to understand the processes by which this occurred and to piece together what remained.

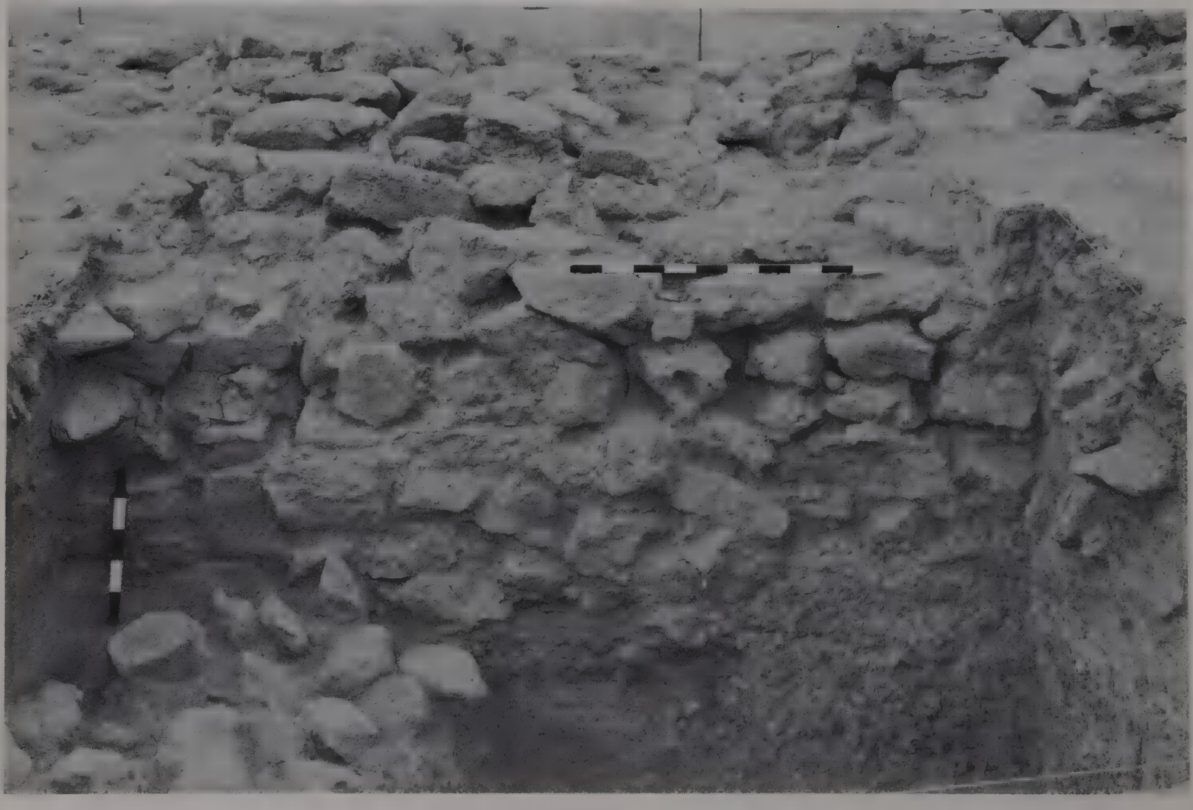
As a result of both excavation and geological survey, we are now in a position to offer firm results regarding both vertical profile and spatial arrangement. These results have also opened up the town site to new possibilities of exploration as an excellent example of urban settlement during EB II-III.

The determinative find regarding the geology of the town interior was the discovery that the incision on the northwest was in the process of cutting its way back through an area sheltering occupational debris of some 8 m in depth. Recovery of this information became possible as the geologic survey attempted to distinguish the natural and artificial deposits within the eroded areas on the north. This task was more difficult than it seemed at first, since the two major incisions on the north had cut down walls which were often quite treacherous to approach. On one of the geological surveys of the site, it was noticed that erosion had sculptured a face along which could be traced many living surfaces and ashy lenses. The location of this face was directly opposite the incision below Field XVII. A stub of mudbrick wall two rows wide and four courses high, with layers abutting it, was observed in the eroded face.

With these results it was possible to conclude further that in this lower, downsloping area of the city there had been built one of the main units of the EB city. Here was preserved some 5 m of occupational depth which, if taken from surface to bedrock in a future season, promises an excellent sequence beginning with EB III on the surface to the earliest periods of the city site, those of EB IB. Thus these results from the geological survey have provided a new key to the site's development. In addition, the cultural levels here contain valuable information regarding the rate of erosion and the different levels of the wadi floor and, thus, are important for the geological history of the site and the wadi below (see pp. 137-54 below).

The three main components of the city investigated during 1977 were: (1) the wall traces ringing

Fig. 7. Inner face of town Wall B in Field VIII.



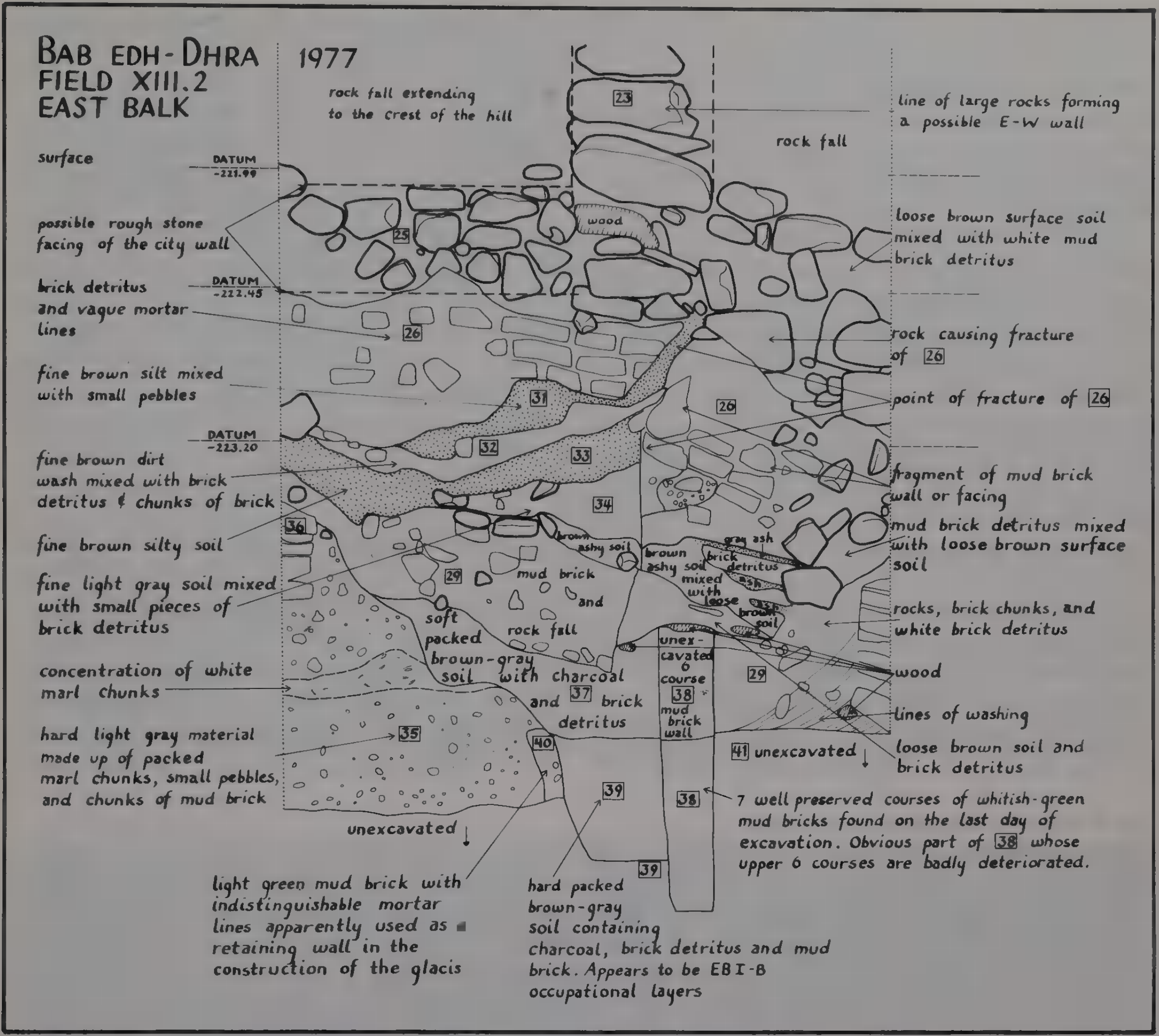

BAB EDH-DHRA
FIELD XIII.2
EAST BALK
1977
rock fall extending to the crest of the hill
23
line of large rocks forming a possible E-W wall
rock fall
surface
DATUM -221.99
possible rough stone facing of the city wall
25
wood
loose brown surface soil mixed with white mud brick detritus
brick detritus and vague mortar lines
DATUM -222.45
26
rock causing fracture of 26
fine brown silt mixed with small pebbles
31
point of fracture of 26
DATUM -223.20
fine brown dirt wash mixed with brick detritus & chunks of brick
32
33
fragment of mud brick wall or facing
34
fine brown silty soil
36
brown ashy soil
gray ash
brown ashy soil
brick detritus
ash
mixed with loose
brown soil
mud brick detritus mixed with loose brown surface soil
fine light gray soil mixed with small pieces of brick detritus
29
mud brick and rock fall
soft packed brown-gray soil with charcoal and 37 brick detritus
unex-cavated 6 course 38 mud brick wall
rocks, brick chunks, and white brick detritus
concentration of white marl chunks
29
wood
lines of washing
hard light gray material made up of packed marl chunks, small pebbles, and chunks of mud brick
35
40
41 unexcavated
loose brown soil and brick detritus
39
38
7 well preserved courses of whitish-green mud bricks found on the last day of excavation. Obvious part of 38 whose upper 6 courses are badly deteriorated.
unexcavated
39
light green mud brick with indistinguishable mortar lines apparently used as a retaining wall in the construction of the glacis
hard packed brown-gray soil containing charcoal, brick detritus and mud brick. Appears to be EB I-B occupational layers

Fig. 8. Drawn section of east balk in Field XIII.2, showing glacislike material (Locus 35), with retaining Wall 40.

the city with their accompanying defensive towers; (2) residential or industrial areas; and (3) the specialized areas, such as those set aside for religious purposes. The defensive wall and structures associated with it were the focus of investigation in Fields VIII, XI, and XIII, opened in 1975 (Rast and Schaub 1978: 9-17), while Field XVI on the north was new. Fields XIV and XVII, first opened in 1977, contained evidence of residential and possibly industrial activity, while Field XII, opened in 1975, was found to contain two phases of a structure which may have had significance as a religious building.

The City Walls and Towers (Fields VIII, XIII, XI, and XVI)

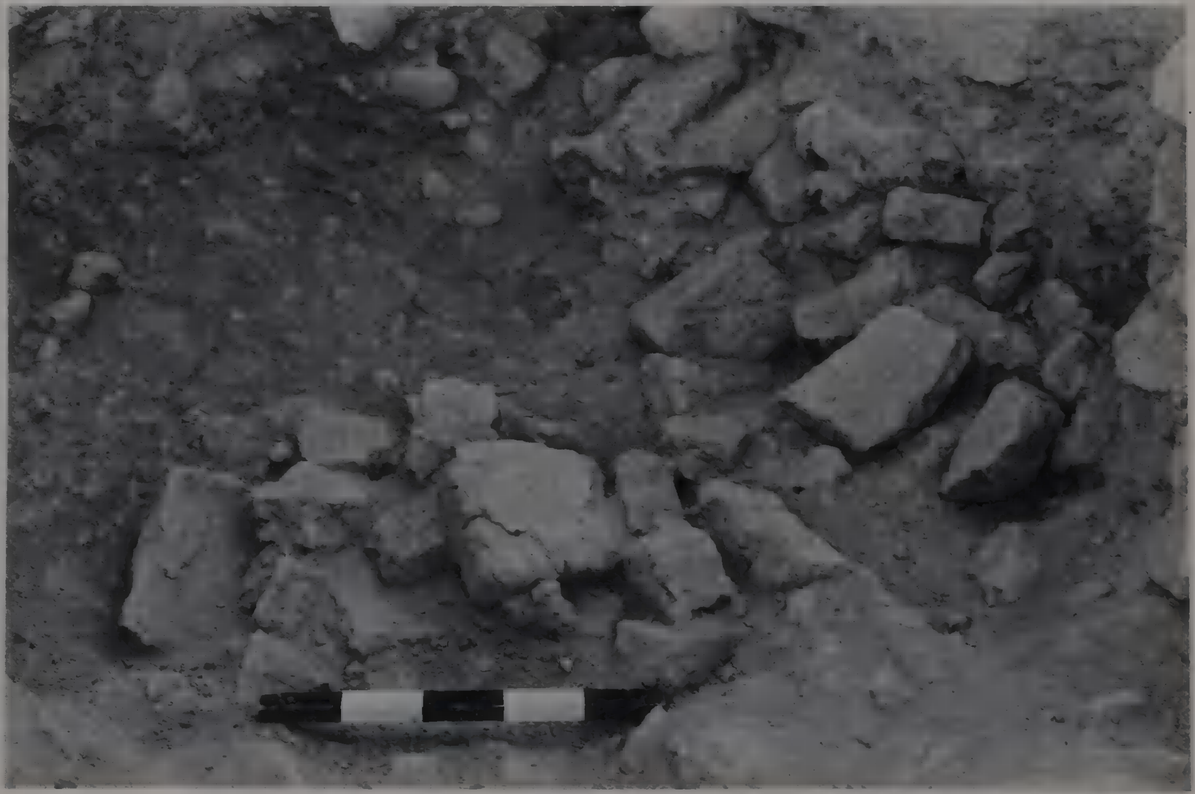
Fields VIII and XIII. In Field VIII north of the city wall, the trench begun in 1975 was taken to sterile soils. The chief result of the work in this area was the exposure of the interior face of Wall A of the EB III city (fig. 7). On the western end of the town in Field XIII, the complexity of the defensive system came into sharper focus during 1977. In both squares of Field XIII the packed layer of white marl (Locus 35), first noted in 1975 (Rast and Schaub 1978: 14) and nearly 1.5 m in depth, appeared. That this layer was man-made was apparent from the numerous small pieces of Lisan marl in which the laminations could still be seen, but which had been heaped in an upward slope from south to north (fig. 8). Wall 40 in the lower part of Field XIII.2 apparently served as a retaining wall for this thick layer of material (fig. 8). The stratigraphy disclosed that this construction postdated the earlier EB IB occupation found in connection with Wall 38 which has been discussed above. The heaped-up material retained by Wall 40 was thus contemporary with other town construction.

The composition of Locus 35 at first suggested glacis material. There was a problem with such an explanation, however, since the material did not slope upward against the wall as is normally the case with a glacis system. Instead, the slope was parallel to the wall so that the rise in material was in the same direction as the wall. To the south of this feature, the area must have been quite low during the period of the city. It was into this low area that the massive amount of stone and brick debris, excavated during 1975 and 1977, had fallen.

If a glacis is doubtful, it seems another explanation may be more correct. It is possible that an artificially elevated area was raised up on the western side on which a structure of some kind projecting from the western defensive wall was placed. It has been observed frequently at Bab edh-Dhra that the soft Lisan marl often required careful preparation for building activity. Thus, examples of stepping, into which the base of the town wall was placed, were found on the east side (Field II). If the EB builders desired to position a tower outside the western wall, it may be assumed that they consolidated the soft marl with a type of platform. It is noteworthy that the small chunks of Lisan marl in the embankment were in a much harder packed matrix in their secondary use then they would have been originally. At the same time, the numerous bricks which fell on the downsloped area (Field XIII.2) must have fallen from a structure above, built on this platform (fig. 9).

This heap of toppled bricks was interesting, even though the bricks were not in situ. They were extremely hard and had a pinkish hue. The ceramic technologist was not inclined to explain them as originally fired brick but rather as mudbrick which had been heated up in the burning of the structure. Their square shape is distinctive since many of the bricks in the town site, as well as in the charnel houses of the cemetery, are rectangular. Square bricks were employed, however, in the construction of the "Northeast Tower"

Fig. 9. Masses of fallen brick in Field XIII.2.



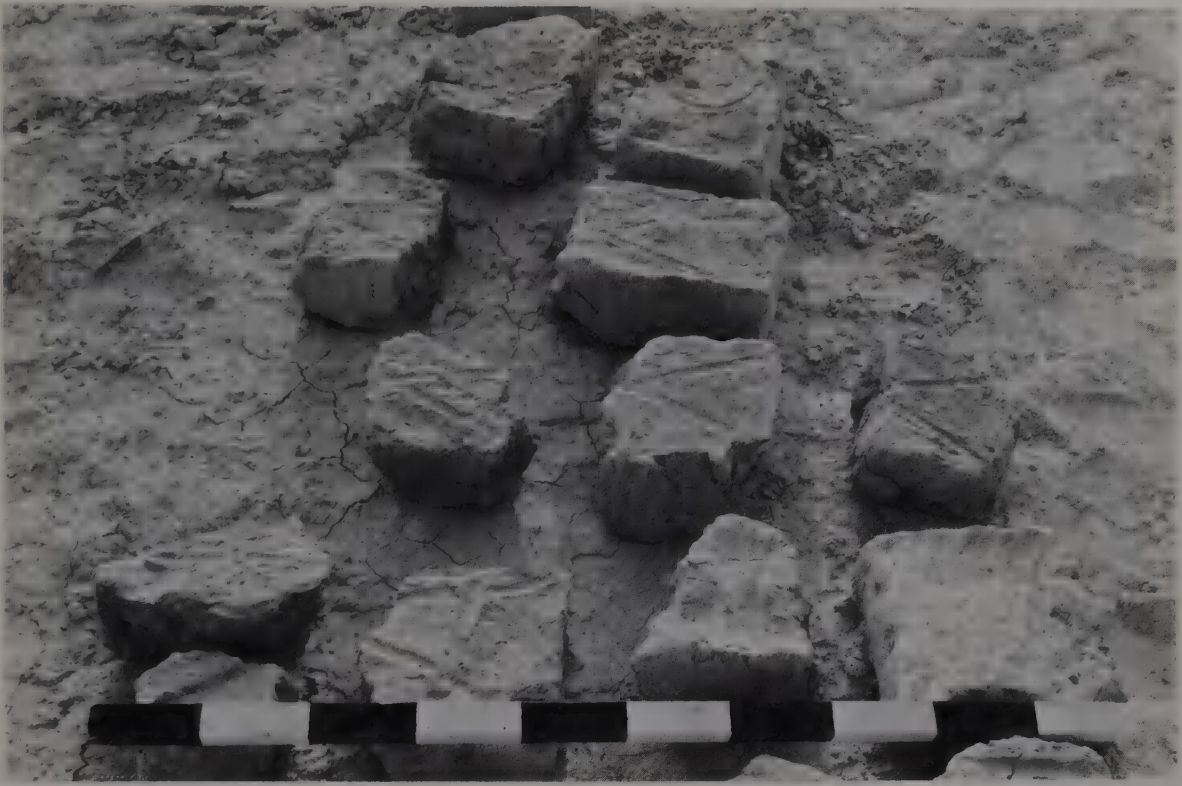
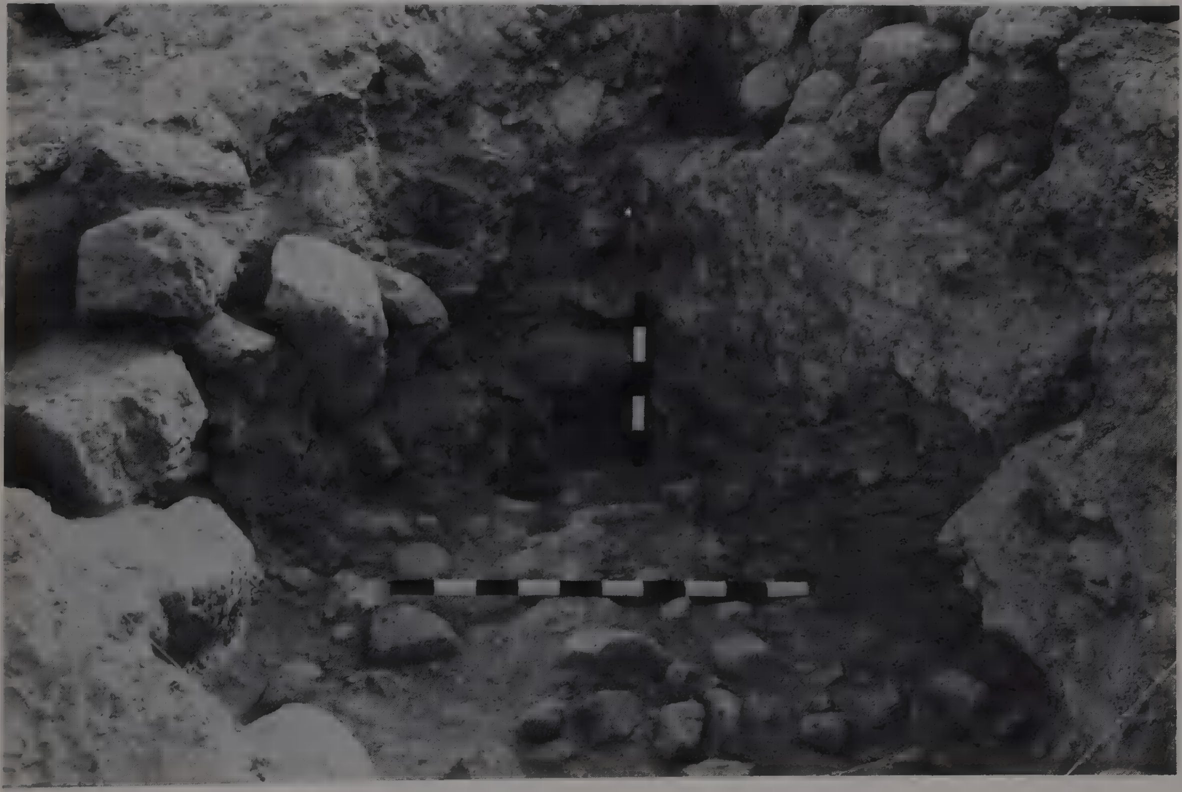


Fig. 10. Masons' marks on bricks from Field XIII.2.

Fig. 11. Mudbrick facing against stone city wall in Field XIII.2, above and to the right of half-meter stick.



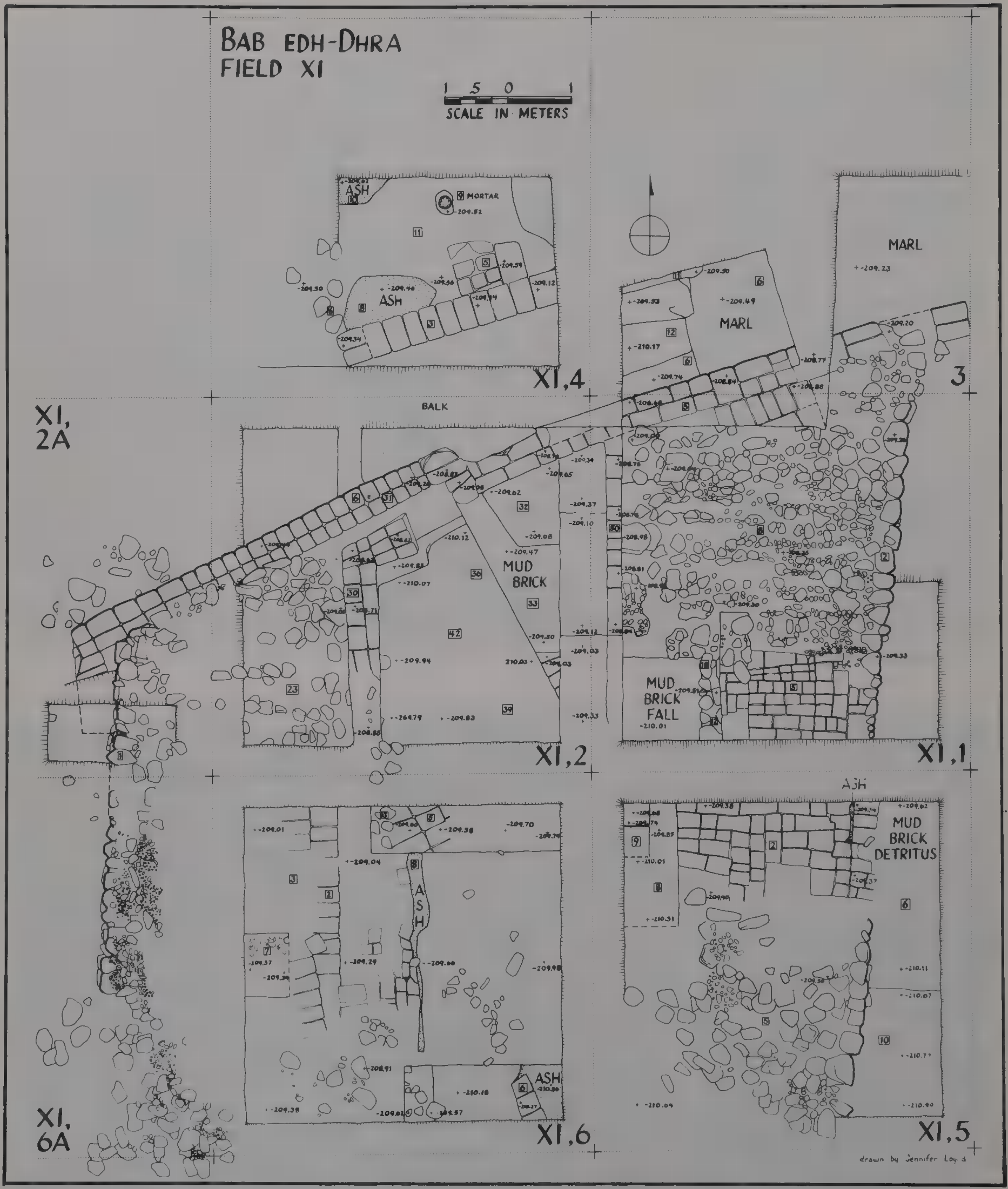


Fig. 12. Plan of Field XI.

in Field XI. Many of the bricks also contained masons' marks (fig. 10), similar to markings of this type on bricks in Charnel House A 51, excavated by Lapp (unpublished).

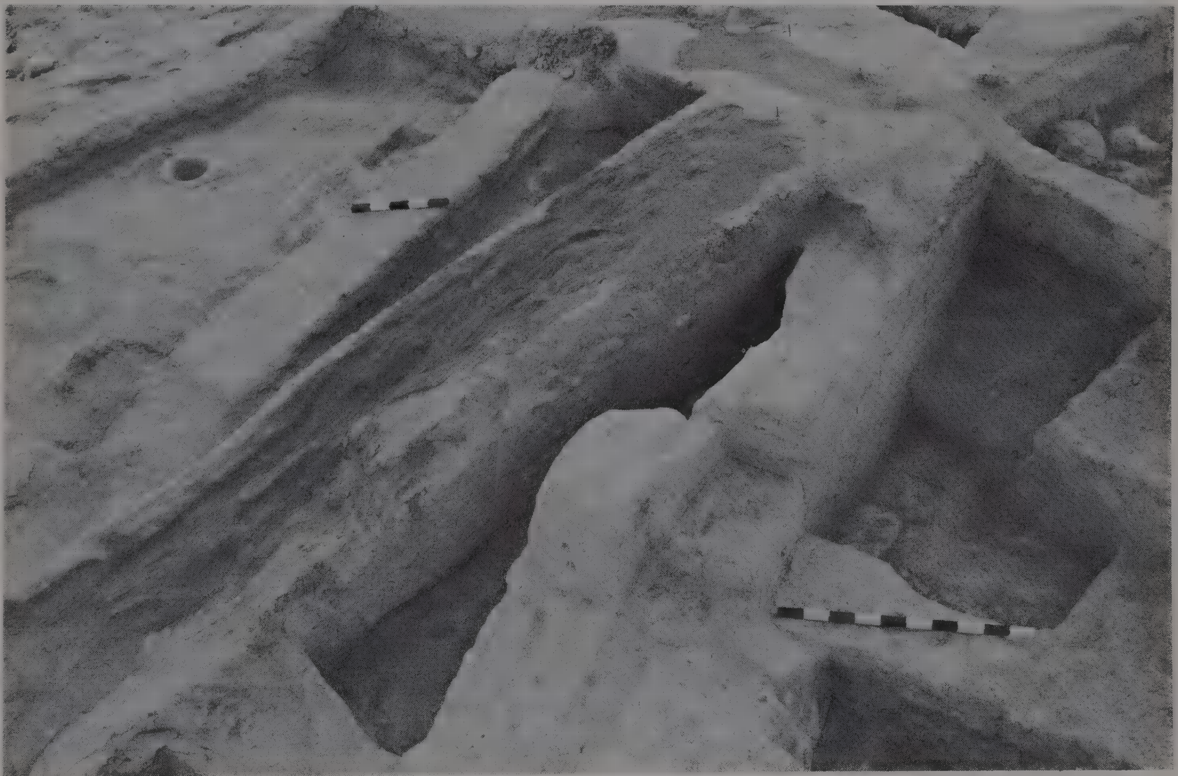
The banked-up area and the remains of what might have been a tower may suggest, then, efforts at strengthening the western access to the site. This is also indicated by the huge boulders used in the wall on this side, in contrast to smaller rock material employed elsewhere on the wall. The city wall on this side was examined in Field XIII.1, and, although a definite stone facing was not found on the exterior, a section of slumped, intact mudbrick (Locus 26) against the outside of Wall A was very likely a remnant of the type of face used elsewhere (fig. 11). It was suggested in connection with the 1975 excavations (Rast and Schaub 1978: 13) that the city wall in places seemed to have contained an exterior and perhaps interior brick facing, and the tower on the northeast was noted as an example. The discovery of a section of mudbrick material in Field XIII lends support to this interpretation. Interestingly enough a portion of the brick facing toward the south was forced downward by pressure of falling material from above and also by water trickle (fig. 11).

Field XI. Corresponding to these constructions on the west is the "Northeast Tower" at the other end of the city (fig. 12). This structure was investigated in a preliminary way in 1975 (Rast and Schaub 1978: 12-14). During 1977 its extent and purpose were examined more closely. The structure is one of the most impressive at the site, even though it survives only in its lower courses. A glance upward to the northeast from within the lower interior city still reveals how impressively the tower must once have dominated this area of the city.

On the north a straight wall (Wall 6) made of mudbricks was oriented from southwest to northeast. It was given a small offset about midway up the tower. This brick wall was preserved to seven courses in the trench cut up against it in Field XI.2a, while in a similar trench in Field XI.3 it stood nine courses high. An odd feature in this structure, noted already in 1975, was the way this northern wall was angled obliquely to the two stone walls (Walls 1 and 2), forming the east and west extents of the tower. The discovery in 1977 that these fortifications had been used in at least two phases helps to clarify this problem, as will be seen presently.

The first item to note is that in a number of places in the tower, walls came to light which were oriented differently from mudbricks placed above the stone base of the tower. Wall 33 in Field XI.2 was a solid mudbrick wall standing six courses high (fig. 13). Against it were layers of fallen brick and ashes. This wall apparently predated the tower of stone and brick since the squared bricks of the

Fig. 13. Ladder shot of Field XI. Wall 6 of Northeast Tower is in the center with Wall 3 and mortar outside to upper left.



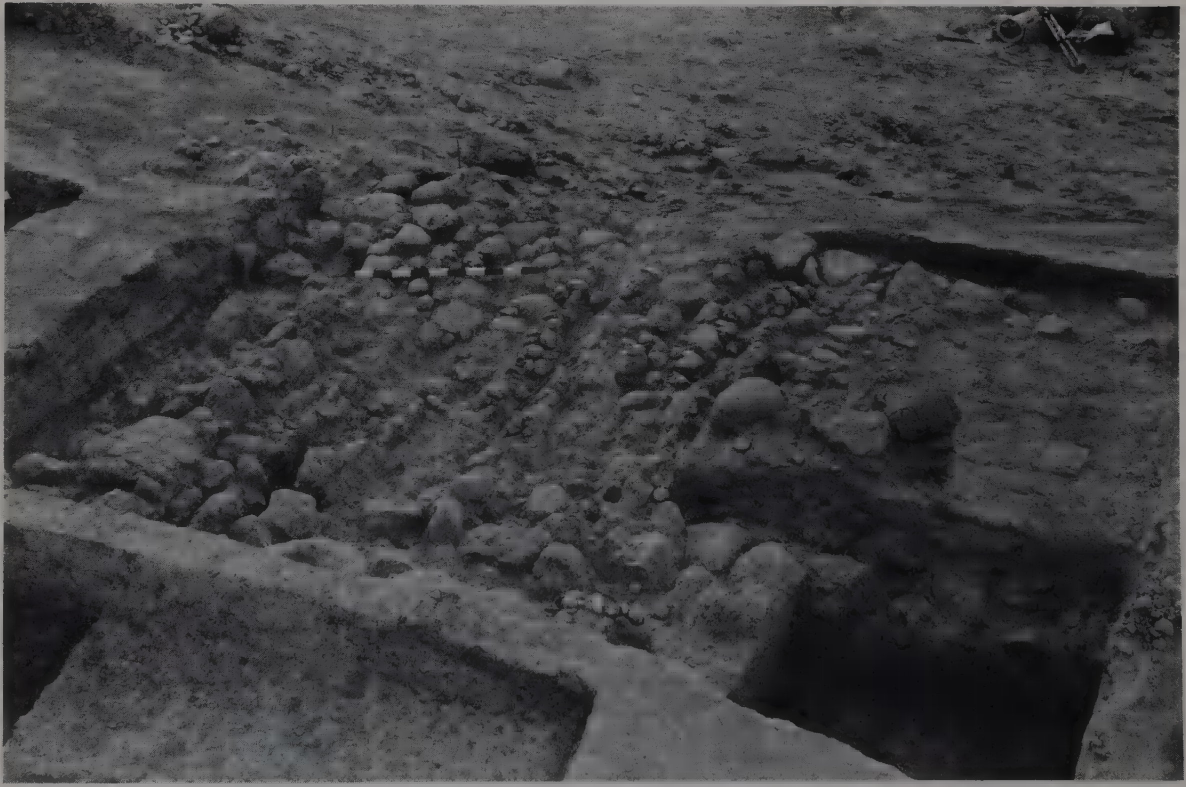
second phase tower were at a higher level to the east of the wall. It is also noteworthy that the orientation of Wall 33 was exactly perpendicular to the long northern wall (Wall 6). The walls in Field XI.6 (Wall 5 and the three bricks of Locus 6) also line up along the same orientation and were found at a lower level. Several bricks along the same axis appeared in Locus 9 of Field XI.5 as well, and these may be the continuation of Wall 33 to the southeast.

There thus seems to be evidence that earlier walls were built up against the northern wall (Wall 6) and that a destruction terminated this phase as evidenced by the debris in Loci 36, 39, and 42 of Field XI.2. We were unable to complete the opening of an area sufficient to establish the nature of this earlier phase, but this should come to light in a future season. The date of this earlier phase also remains in question, although on the basis of limited ceramic material retrieved during 1977, it seems as though it too was constructed in EB III as was the stone-based tower.

Sometime after the destruction of the earlier constructions, a later tower was built against what survived of the northern wall. The builders chose a somewhat different orientation from the earlier walls, due either to the general plan of the later city, or in order to make safer and better use of the high area at the northeast. The lines of the east and west walls could not definitely be established on the south where erosion ruined further traces. The southern wall was not preserved, but it seems likely that it would have connected with the eastern wall nearly at the point where this latter wall terminated at the southeast corner of Field XI.5.

The most common feature of the second phase tower was the large amount of mudbrick placed over carefully laid rows of stone (fig. 14). This feature was noted in Field XI.1 in the 1975 season. Other areas where mudbrick was discovered above a bedding of either pebbles or larger stones included Squares 2, 5, and 6. In each of these the bricks on the stone foundation were laid according to the new orientation of the eastern and western walls (fig. 12). Next to the northern wall (Wall 6) the gaps were filled with stones, and odd-shaped bricks were used to complete the intersection with

Fig. 14. Bricks on stone base with lines of small stones (Locus 8) in Northeast Tower.



this main wall. It would appear that the stone bedding served both to bond the bottom mudbrick courses to a solid foundation and to deter the decomposing effects of moisture. Jericho had similar examples of small pebble layers wedged between the mudbricks of its city wall (Garstang 1932: 8-9, fig. 3).

A vexing problem regarding this later tower is the extent of the area covered by the mudbrick superstructure and the purpose of the latter. As discovered, a large part of the tower area consisted of stone and pebble foundation with bricks above. Thus, it seemed to be a massive complex, perhaps a platform for further structures above and adjacent to the earlier Wall 33. With further clearance of this area during the next season it may be possible to establish the outline of a room. The earlier phase with mudbrick walls, such as Wall 33, seems to have had rooms in the tower, but these were not explored in detail during 1977 since excavations were concentrated in the later phase construction.

Associated with the tower was Wall 3 in Field XI.4 on the north side (fig. 13). Only a small area associated with this wall was excavated, and thus no firm conclusions could be drawn about these remains. They are suggestive, however, of a condition similar to what Lapp encountered in Field I in 1965—an extramural, towerlike structure outside the city wall, with its inner wall parallel to the city wall but placed approximately a meter beyond the latter (Lapp 1968: 4-5). Recently, the structure in Field I at Bab edh-Dhra has been interpreted as a postern tower (Helms 1975: 142-44), and it may be that this structure will prove to be something similar. In that case we would have an interesting combination of an exterior postern connected with an adjacent intramural tower. To the north of this wall was a hollowed-out stone, probably a mortar.

Finally, the work in Field XI in 1977 may help to resolve the problem of the city wall on the north side. In the report for the 1975 season the problem of this tower was noted and it was suggested that it may have been free-standing (Rast and Schaub 1978: 14). This is still a possibility, although it raises the problem of why the EB builders would leave this area open when the remainder of the city was enclosed by such an imposing wall. Another possibility is that the long wall of mudbrick on the north side (Wall 6), against which the second-phase, stone-based, brick tower was built, served as an extension of the north wall of the town in this area. The oblique orientation of Wall 6 to the later tower seems to make sense only if it were directly related to the city wall. The new topographical plan of the city (fig. 6), on the basis of discoveries in Field XVI, has projected the town wall directly through Field XI. It is notable that the north wall of the Northeast Tower lines up exactly with that projection.

There is a problem, however, on both the east and west ends in that evidence for the city wall is absent at both points. Yet it is also true that on both of these sides the area slopes sharply just beyond the tower, and it is possible that the wall has eroded at these two ends. A number of bricks extending beyond the tower were traced at both sides, and these may be sparse remnants of the city wall as it once continued here (fig. 12). To the east of the tower the military operations of recent years have also caused severe damage, although the line of the wall can be picked up again farther to the east (fig. 6). The predominant use of mudbrick in the Northeast Tower area contrasts in any case with the large amount of stone employed in the city wall to the southeast of the tower, although a brick superstructure probably had also been placed above the stone base at this point.

According to preliminary pottery study, the two phases of the Northeast Tower date to EB III, the latest phase being late in EB III. Whether an EB II use of the area occurred remains to be seen in a future season. That the late-phase tower was destroyed by fire was apparent in Field XI.2, where the debris above Wall 33 consisted of small bits of charcoal and many fragments of broken as well as fallen bricks. In Field XI.6, two large ash areas represented the remains of charred wood within the tower structure. This may be some of the best evidence yet discovered for the destruction of the city late in EB III.

Field XVI. The line of the city wall seems to have appeared in a new field opened on the north, Field XVI (fig. 6). The objective in opening this field was to reexamine the problem of the line of the city wall on the north. We had begun to question parts of the plan of the city made in 1965, and still used in the 1975 report (Rast and Schaub 1978: 3). On that plan the northern wall was projected from a point near the Northeast Tower, then made to bend back toward the interior of the

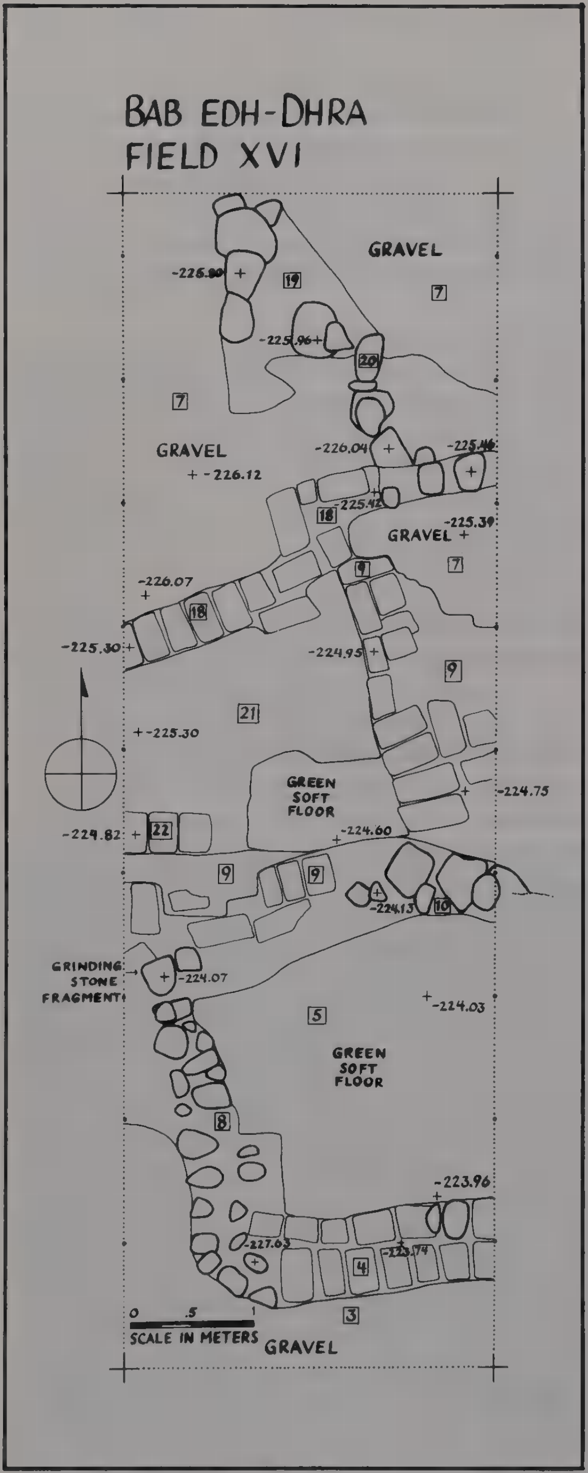


Fig. 15. Plan of Field XVI.

city. This projection was made on the basis of stones which closer investigation has shown to be toppled stones in a gully, giving the illusion of a wall. It appeared to us to be an anomaly that the northern wall could have been positioned only 50 m from the south wall as drawn on the 1965 plan. The geological survey had also quickened expectations that there might be remains on the uneroded high area between the two severe incisions on the north side of the site.

The Field XVI trench was only 3 m wide but was extended north-south to a length needed to clarify the area. At the end of the season the trench was 9 m long (fig. 15). The area is above the north slope and, although it is still well preserved, erosion is beginning to take its toll. Excavation showed that, following the end of the EB III city, an EB IV mudbrick structure was built over the earlier ruins (see the discussion of EB IV below). Wall 9 belonged to this phase and included several surfaces associated with it. A number of pits cut in the area also belonged to the EB IV settlement. This is the first clear evidence within the city of an EB IV usage following the destruction in EB III, necessitating a change in the previous view (Rast and Schaub 1978: 14). Several excellent groups of EB IV pottery came from these loci.

The EB III building remains below it were considerable. Wall 18 was a well-preserved section containing an offset with plaster on the exterior (fig. 16). It is possible, although not certain, that Wall 4, some 7 m to the south, was a parallel wall, and that the two may represent the inner and outer faces of the city wall during EB III. Wall 4 was at a higher elevation, being built up against the natural gravel which, as in Field XII, had to be contended with by the ancient builders. Behind Wall 18 was a fill of stones and mudbrick (Locus 21). The relation of these two walls will be examined more closely in the next season.

Two metal weapons (nos. 1256 and 1257) came from the debris just north of Wall 4, one of which may be a javelin (no. 1256) and the other a dagger (no. 1257). Although the pottery from the loci from which they came was mixed with EB III and EB IV types, it is possible that the metals are to be dated to the town wall phase and that they represent late EB III. They may even be weapons used in the final defense of the EB III city. Other objects from this field included a completely preserved clay tournette (no. 1258) and a fractured slate palette (no. 1262) of the type found in several of the charnel houses.

Given these results in Field XVI, a new perspec-

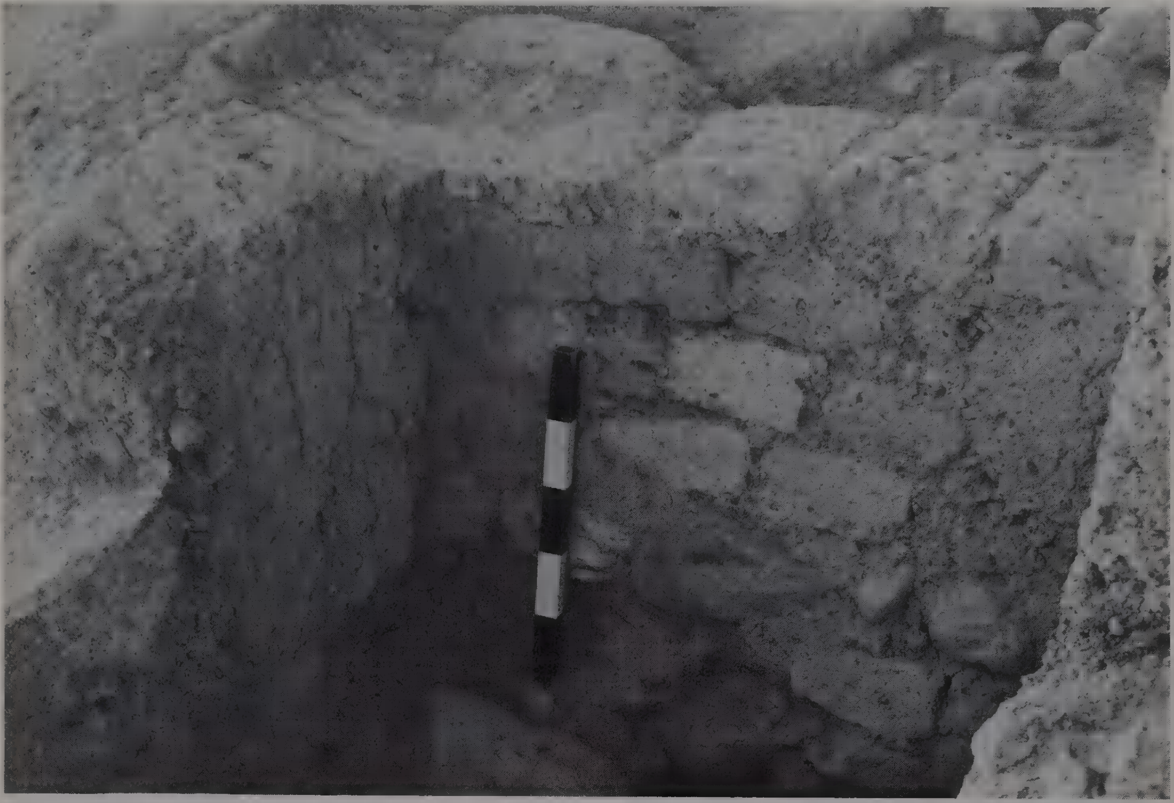


Fig. 16. Wall 18 in Field XVI.1, looking southeast.

tive on the size and character of the city becomes possible. In contrast to the 1965 plan, the dimensions as now determined would point to a city of at least four hectares in area. It would also suggest that, before erosion cut off parts of the north end, settlement across the lower hills and areas inside the city was substantial. This is especially clear in cases where evidence has survived, such as in Field XVII.

A final point is noteworthy. The offset in Wall 18 can be compared to the same type of right angle shift of direction in the northern wall of the Northeast Tower (fig. 12), which may be evidence supporting the view that these two sections of wall are part of the same defensive system. The tendency of the builders at Bab edh-Dhra to place projections of this type in their walls, for whatever reasons, is not unparalleled. A similar technique was encountered at several other EB sites (Loud 1948: fig. 392 [Locus 4045 B]).

Residential and Industrial Areas

Fields XIV and XVII. Fields XIV and XVII provided the first substantial evidence for intramural activity areas. Squares XIV.1 and XVII.1 were laid out as trial squares, with the objective of determining the presence or absence of settlement remains within the city, and their nature. Both squares were sufficiently productive to require expansion in a future season. It is clear that the expedition's objectives of acquiring data on the sequence of living arrangements during the town's various phases, as well as data on spatial arrangements on the interior of the town, will be obtainable.

Field XIV was established toward the center of the city along a flat area which slopes toward the north. Beyond Field XIV the terrain merges into the deep erosional incision on the northwest. Above this latter incision Field XVII was located. Both Fields XIV and XVII, therefore, represent areas of usage within the heart of the ancient town (fig. 6).

The most instructive discovery in Field XIV occurred at the point of the southern balk. Here a well-made sloping wall of mudbrick was uncovered along the entire extent of the south balk. It was apparent that this wall did not belong to a

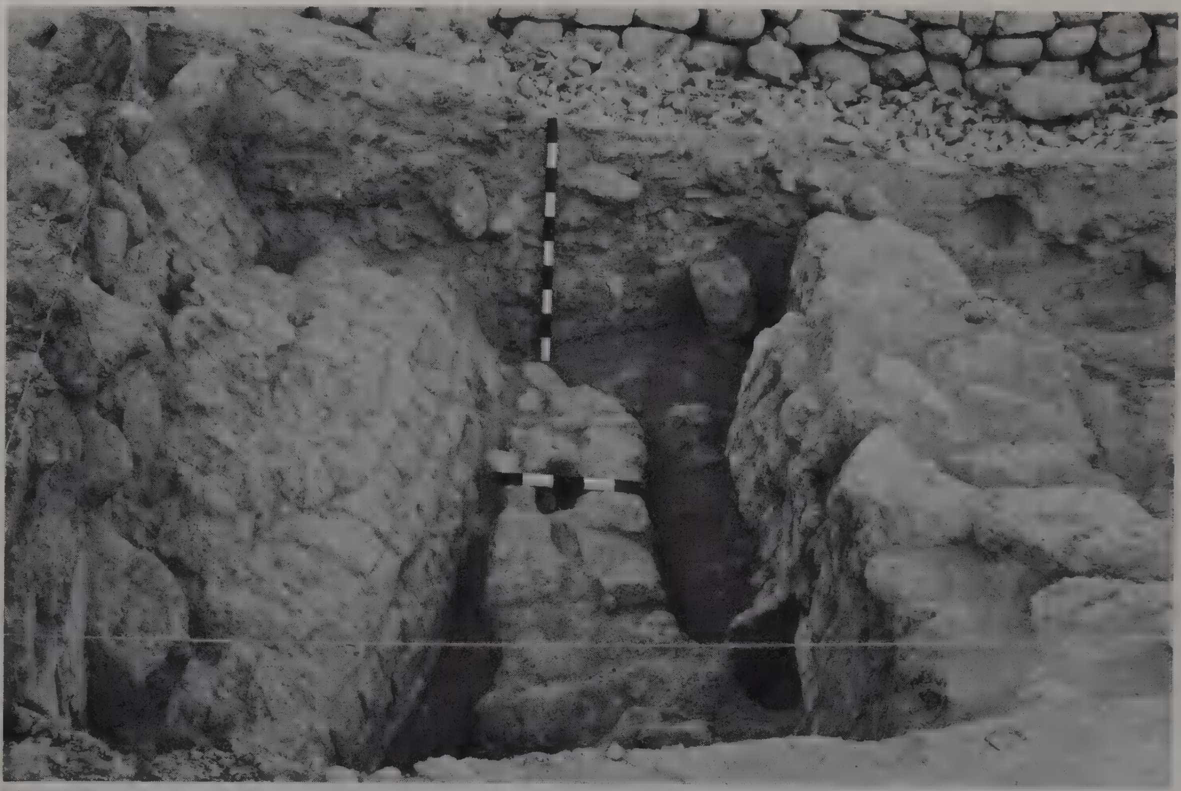
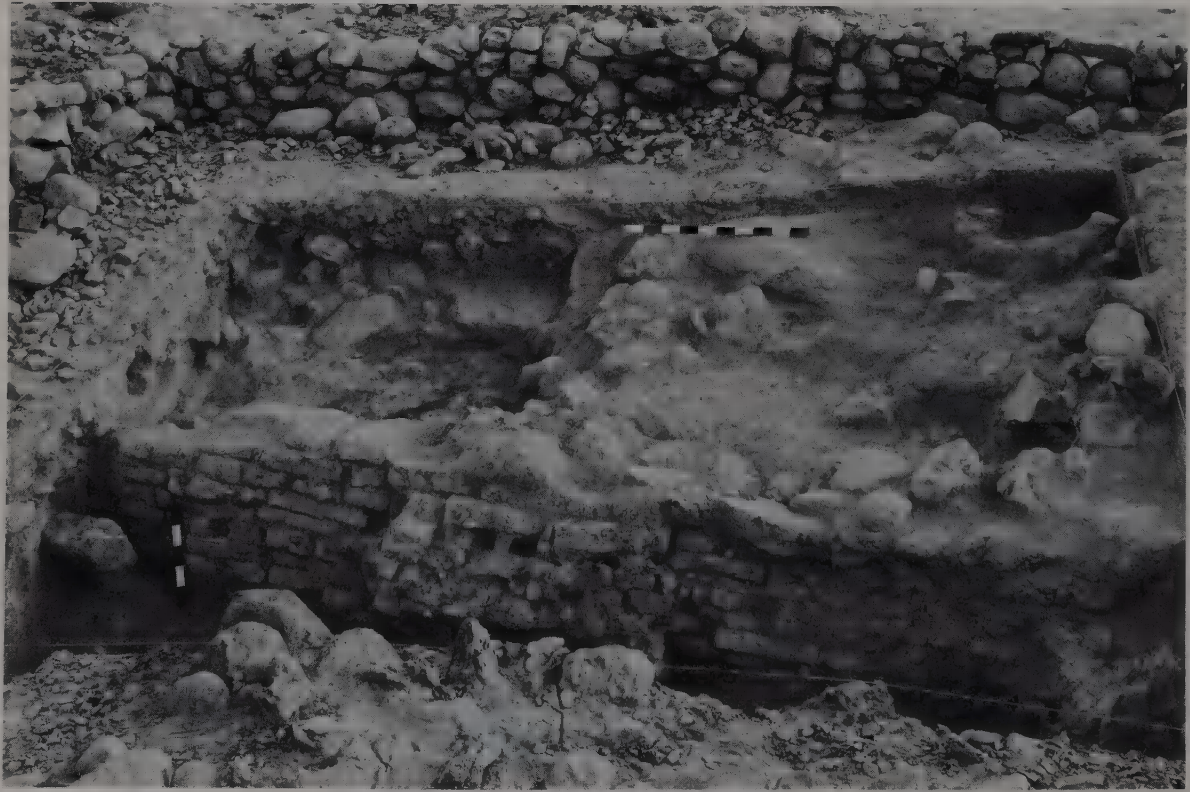


Fig. 17. Retaining wall (Locus 14) in Field XIV.1, looking west.

Fig. 18. Wall 10 in Field XIV.1, looking north.



structure but had been built against the marl and gravel slopes behind, above which was the upper level of the city (fig. 17). There is little question that Wall 14 was a major retaining wall along this area, accommodating an occupational insula below it. The discovery of this wall revealed the engineering techniques of the town builders. In this case once again the city builders were forced to contend with the challenges of the two major soil types at the site: the Lisan marl which can easily become powdery and the rather fine gravel. Their use of this technique allowed them to control some of the refractory features of the site and thus to make it suitable for habitation.

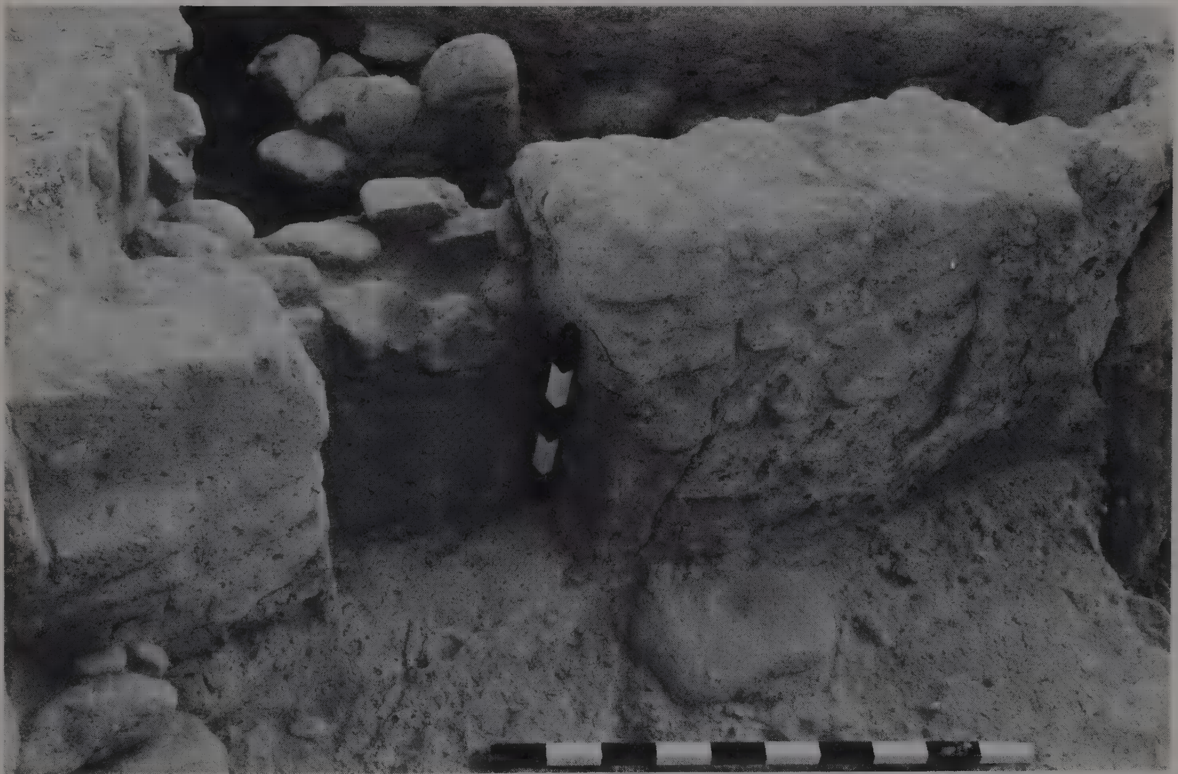
Although Wall 14 gives every indication of extending around the entire lower slope, only a small portion of it was exposed in Field XIV.1. At least 13 vertical courses of brick were uncovered in 1977, and yet the lowest course was not reached. Further courses of brick were also above the present top of the wall, but these had been washed off or toppled with the fall of stones and bricks from above.

Approximately 1 m north of the retaining wall a section of mudbrick wall (Wall 10) appeared. In contrast to Wall 14 this wall stood vertical and was made of formed, rectangular bricks of the usual city type. It is clear that this wall belonged to a structure, the other parts of which were not cleared during 1977 (fig. 18). Between the retaining wall and Wall 10 was a passage, possibly a narrow street on which were lying bricks which had fallen from the retaining wall, and stones from the structures on the higher area to the north. On the other hand, some of the rough-edged brick about half-way the length of Wall 10 suggests there may have been a crosswall connected with Wall 14.

There are indications that the occupational debris is deep in Field XIV, as in Field XVII, so that only the upper layers appear to have been touched at this point. All pottery found in this field during 1977 was attributed to EB III. In a further season this field will be expanded horizontally, and its lower remains traced.

Field XVII.1 was a limited trench laid out over one of the preserved occupational areas discovered through the geologic investigation. At one point where the erosional incision on the northwest had cut a natural face, the debris layers could be measured to some 8 m in depth. The 1.5 × 2.5-m

Fig. 19. Doorway and door socket in Field XVII.1, looking west.

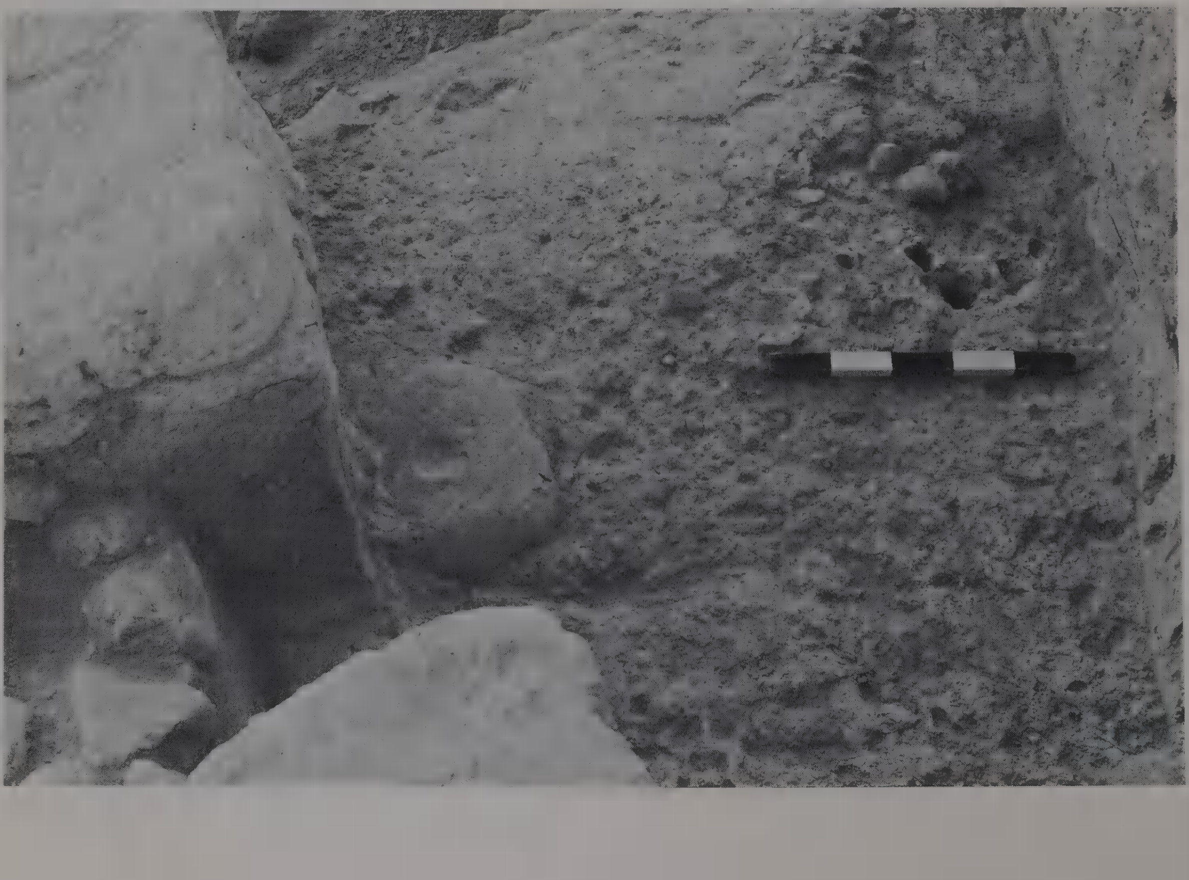


trench of Field XVII.1 was planned as a test trench from surface to virgin soil to determine the nature of the debris and to recover the sequence of pottery and artifactual remains. These plans were altered after substantial mudbrick structures began to appear, leading to the decision to examine these with a broader horizontal exposure before taking the area lower.

Only a few cms below the surface the upper levels of Wall 4 began to appear, with Wall 6 appearing similarly across a gap to the east. This gap between the two walls turned out to be a doorway into a structure. When the floor was reached, a doorsocket was found in situ next to Wall 6 (fig. 19). The most curious feature in this structure was the surface to the south of the doorway. It is not possible to tell whether this surface represented the interior or exterior of the building, but it consisted of a hard-packed, white, plaster material (Locus 16). In the floor were several small holes filled with a fine, brown soil. These had average diameters of 10 cm, and several which were cleaned were at least 10 cm deep, although they could be even deeper. At the tops of the holes the plaster was often lapped onto the surface (fig. 20). Since this locus appeared near the end of the excavation, it was decided to postpone full clearance of the floor and its relation to the mudbrick structure until a larger area is exposed. The area was covered over with a plaster sheet and infilled.

Both Fields XIV and XVII, therefore, are indicative of the substantial usage of the town on the interior. It seems that Field XIV was consolidated as an area for intensive usage, and various residential units should come to light in this area in future investigation. Field XVII, too, has evidence for structures which could be residences, although the floor in the mudbrick structure suggests a technical employment of the area as well. The two fields contain evidence that the interior town of Bab edh-Dhra in EB III, and probably EB II, was built on a number of different levels. The EB III people used the natural inclines of the site, which may explain why little is left on the upper levels, such as in the sterile Field XV. Such areas were much more subject to erosion, while the lower levels were covered over by the toppled stones and debris from the upper town; and, thus, some of their remains were protected from erosion and washout

Fig. 20. Plaster flooring with holes in Field XVII.1.



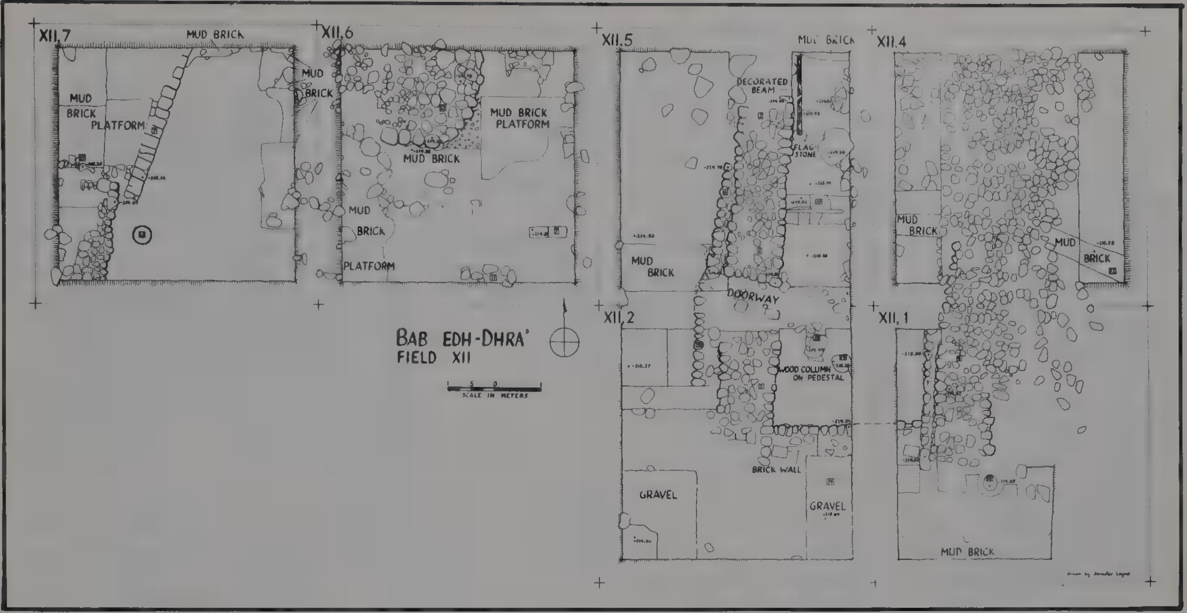


Fig. 21. Plan of Field XII.

by the winter rains. In any case, it is apparent that the entire lower northwest precinct of the city was heavily built up with structures, some of which will be clarified in terms of function and distribution in the next season.

A Bab edh-Dhra Sanctuary (Field XII)

This field presents a challenging problem area within the city. Located on the southwest, it is the second highest area of the site, being slightly lower than the dominating tower area of Field XI. The significant succession of buildings discovered in this field suggests that the area may have quartered the main sanctuary at Bab edh-Dhra during the EB II and EB III city phases. The field has the broadest horizontal exposure in the excavations thus far, but the complex of installations stretches out even farther than the areas excavated (fig. 21).

Excavation during 1977 identified three phases of activity in Field XII. The upper two phases are evident in two different rectangular structures, the one superimposed upon the other. Beneath these were several lines of mudbrick appearing in three squares which apparently represent the earliest use of the area during EB IB. The discussion here begins with the uppermost construction phase.

During the 1975 season a wide stone area (Locus 6, Field XII.5), now known to be a wall, had been encountered in the initial exploration (Rast and Schaub 1978: 15-17). At that time it was proposed that it might be a stone walkway following the slope to the north. The larger exposure during 1977 showed that this locus

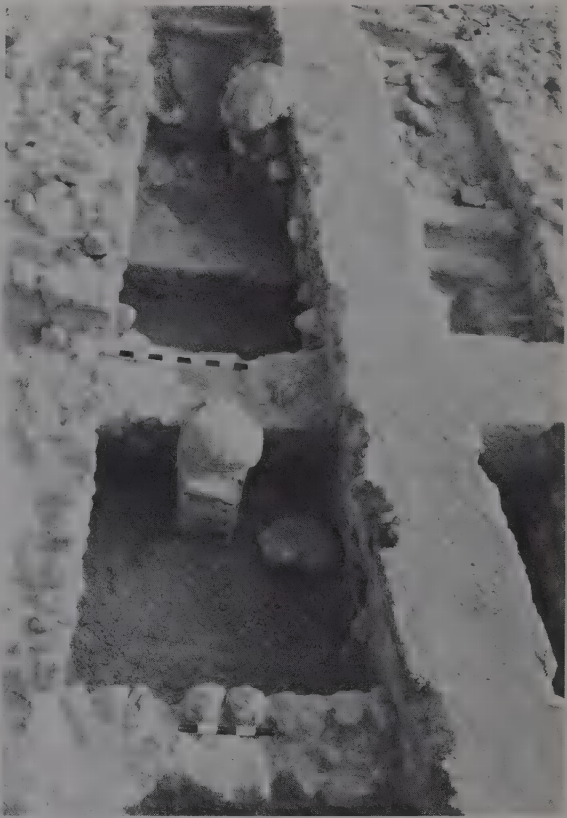


Fig. 22. Rectangular sanctuary in Field XII, looking north. Wall 2 on left and 4 and 7 on right. Beam with decoration at upper left.

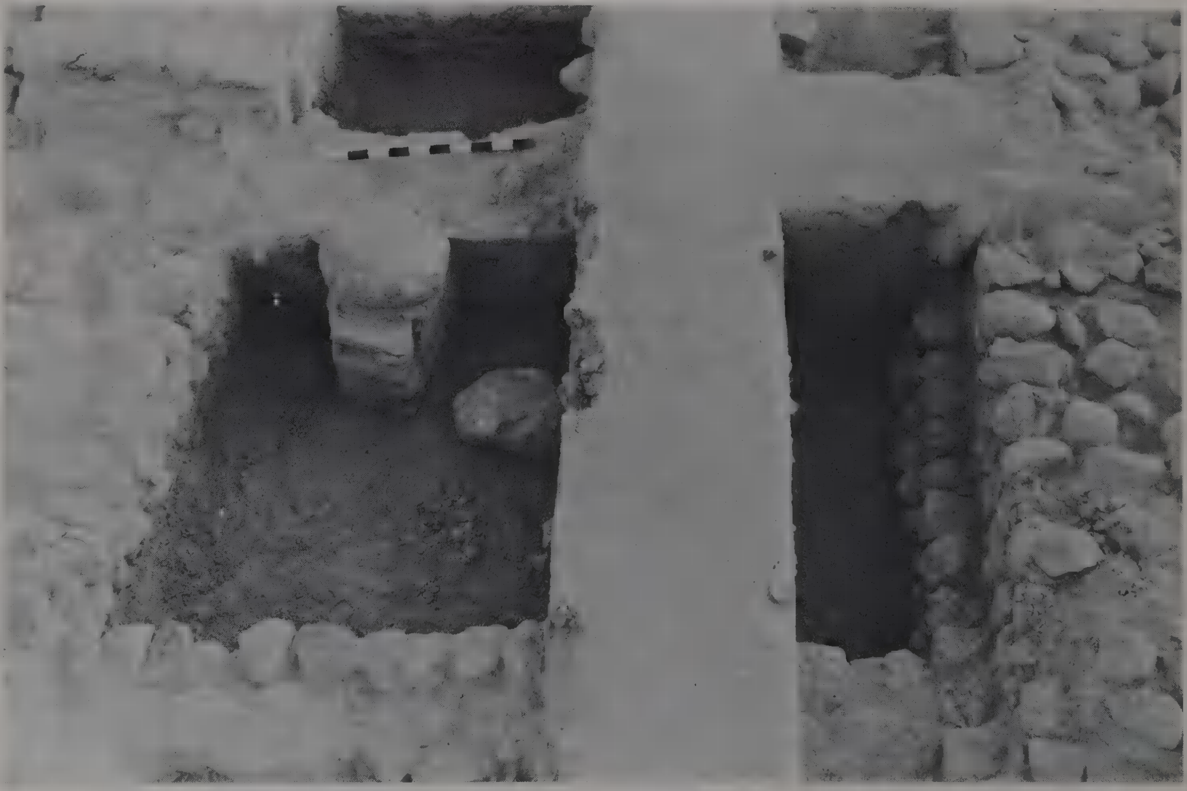
(Locus 6), some 1.25 m in width, was the western wall of a building, the eastern wall of which was found in Locus 4 of Field XII.1 and the southern in Locus 10 of Field XII.1 (fig. 22). The northern wall of the same structure has not yet been located.

The stones used in the walls of this building were mostly rough field stones, averaging between 0.25 and 0.30 m in length. Many fallen stones from the original wall were strewn about the area, as can be seen in Field XII.4 where the fallen stones were not cleared but were drawn on the plan. A noteworthy feature is that the stones in the wall were not placed directly against or on top of one another. Rather, large amounts of hard, mudlike plaster were laid up between the stones, both vertically and horizontally. On the interior face, plaster with finger impressions was found in several places. This late-phase wall was preserved to a depth of three, and in some cases four, courses. Wall 10 on the south was not as wide as the longer parallel north-south walls, being only 0.75 m wide. This wall was apparently used in both the earlier-phase building and the later one, judging from the way it was bonded secondarily to the west wall of the late-phase building at the southwest corner. A doorway into the structure was in the west wall, offset toward the south side of this wall.

To the west of this building was a large, mostly open area in Squares 2, 5, 6, and 7 in which extensive bricklike pavement remains were uncovered during the 1975 season. Sometimes the pavement seemed to have definite brick lines, while often it consisted of a hard, bricklike surface. Since a great amount of gravel was found in the area it would appear that the EB builders laid the pavement over the gravel for a functional as well as aesthetic purpose. In some cases the gravel seemed to be natural but in other places it may have been man-laid. It was much like the gravel in Field XVI, which also had to be contended with in the constructions in that area.

The interpretation which comes to mind most readily is that the pavement served as a court connected with the late-phase rectangular struc-

Fig. 23. South interior of sanctuary of Field XII showing earlier phase Wall 7 with Wall 4 above it on right.



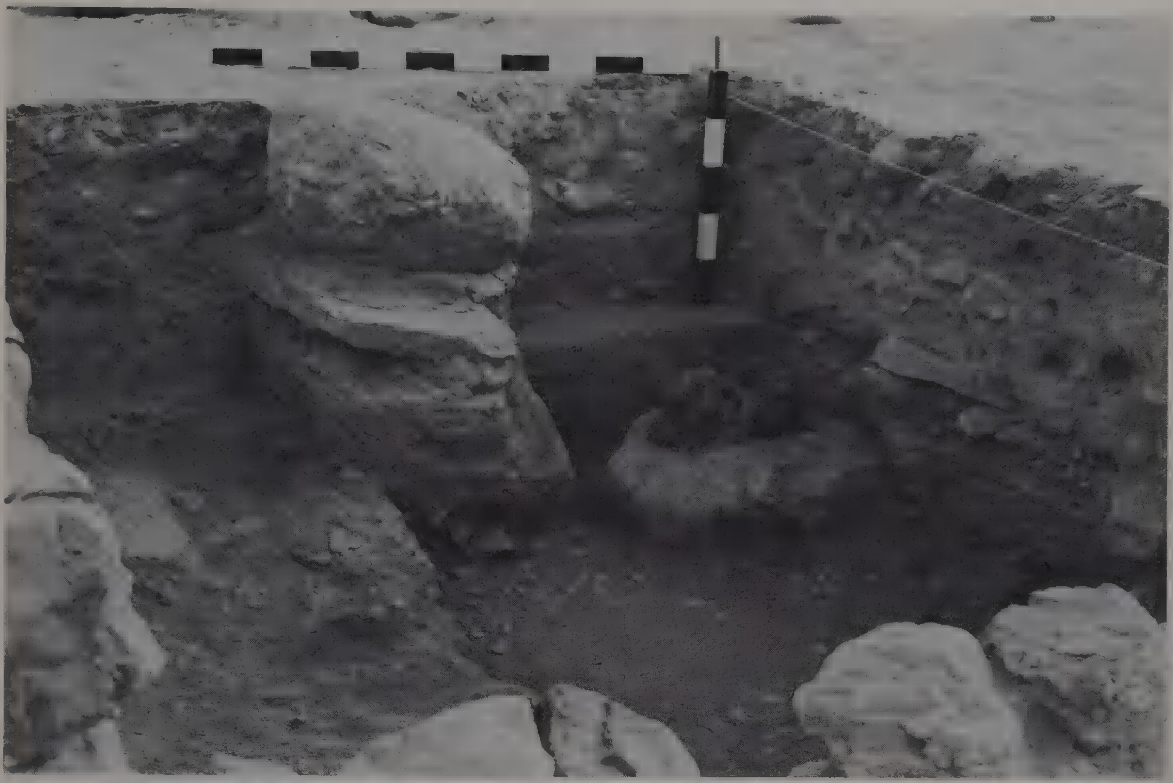


Fig. 24. Remnant of a wooden column on pedestal (Locus 24) in Field XII.

ture. This is bolstered by evidence from Field XII.5 that the bricklike pavement was superimposed over the earlier Wall 6 but was found directly against the later-phase Wall 2. Similarly, the pavement of this phase abutted the stones of the partly excavated circular Locus 13 in Field XII.6. Farther to the west in Field XII.7, a similar paving on a gravel matrix was traced. It was found above the earlier brick Wall 7 but abutted the *tabun* (Locus 13), as well as the cobbled wall (Locus 12). The small east-west wall (Locus 15) appears to have been an addition at the very end of this phase. The latter was not well made and even employed a reused mortar as part of its material.

Within the rectangular building was evidence of the earlier-phase usage, as well as several constructional features and objects of importance for the function of the building. First, the wall lines of the buildings of both phases were visible in the interior, the eastern wall of the earlier structure being found in Field XII.1 (fig. 23), corresponding to the western wall of this phase in Field XII.2 and 5. The large stone resting on a flagstone (Locus 25) in Field XII.2 was apparently a constructional feature of the late-phase building, having served probably as a pedestal for a wooden column. A lower stone (Locus 25) to the east, belonging with the earlier-phase building, was obviously a pedestal for a wooden column since the lower part of a beam was still preserved upon it (fig. 24). Other columns may have been placed in a line on the interior of the earlier building, and one or more pedestals may be concealed under the major balk through the building, not removed during 1977.

Other items of importance belonging to the late-phase building were two pieces identified in a preliminary way as ivory, found in two different places in Field XII.5, and several pieces of reed matting adhering to bricklike pieces on the floor near the doorway interior. These matting pieces may have been a covering over the floor of the structure, although they could have fallen from the ceiling. Finally, a large wooden beam appeared in the north part of Field XII.5 immediately adjacent to the wall (fig. 25). This beam was unusual because of its dado-like design, composed of squares inlaid with a plasterlike material. The design either had decorative significance or it may have served a functional purpose. Most of the beam was removed, with some parts being desig-

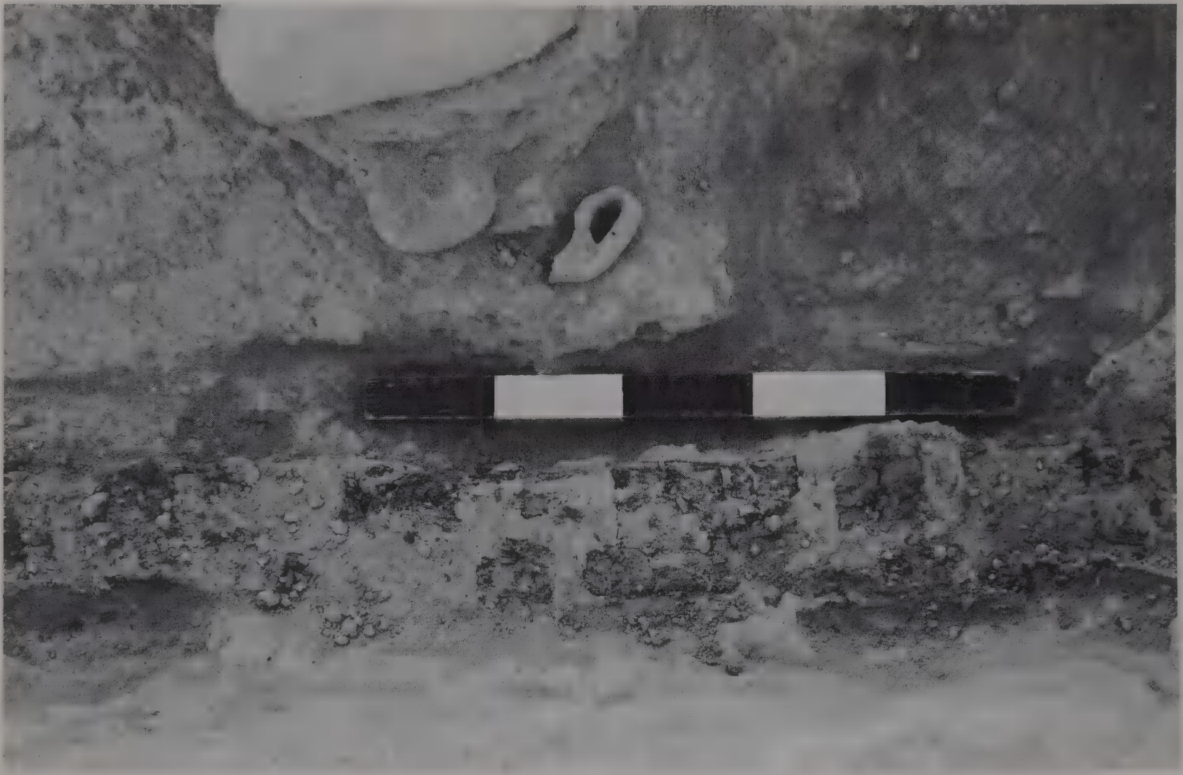
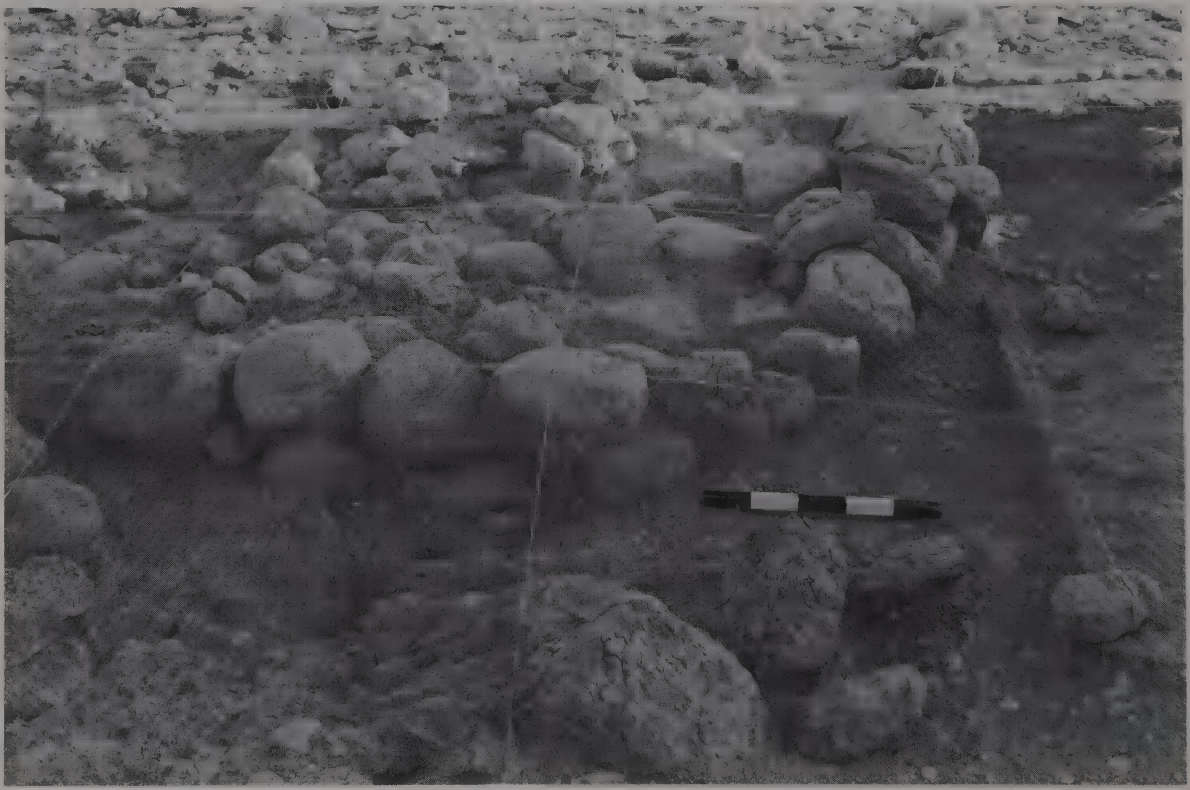


Fig. 25. Decorated beam in Field XII.5.

Fig. 26. Circular installation construction, possibly an altar, in Field XII.6.



nated for laboratory study, while the design on several larger pieces is being examined more closely. A number of flagstones appeared in Field XII.5, suggesting that this part of the interior of the structure may have been paved.

The excavation in Field XII concentrated on the latest-phase building. A small area in Field XII.5 and 2, however, was excavated further in the interior of the structure. In Field XII.2 it was discovered that the surfaces of the two structures were separated by a gravel fill, showing that some of the gravels in the area were man-laid and not natural. Judging from the considerable burn on the floor of the earlier structure, it appears that this early-phase building may have been destroyed by fire, and that a new one was built to succeed it. In Field XII.5 the pottery evidence suggested that the earlier-phase structure is to be dated to EB II, while the late-phase structure with its associated pavement to the west contained homogeneous EB III pottery throughout.

It is perhaps too early to be conclusive concerning these structures and the area as a whole. A sanctuary with a possible altar or cult installation (Locus 13) suggests itself (fig. 26). The pure, rectangular form of the buildings classifies them with the broad-roomed temples identified as EB shrines or temples (Hennessy 1976: 66-67, pl. 54; Ben-Tor 1973). The parallel between Locus 13 and Altar 4017 at Megiddo is noteworthy, although the latter was reused in later MB temples, and excavation did not clarify its relation to an earlier sanctuary (Loud 1948: 73, fig. 180). Even more notable, however, is the Ein Gedi Chalcolithic temple located just northwest of Bab edh-Dhra across the Dead Sea. Ben-Tor (1973) has suggested that the Ein Gedi temple was a prototype of EB II temples, and the Bab edh-Dhra example may show how the influence of this aspect of Chalcolithic culture continued into EB III. The Ein Gedi sanctuary included a circular installation in the courtyard as well, which may have been used for water libations (Ussishkin 1972: 31-32, figs. 12-13, 17). Since both the Megiddo and Ein Gedi circular features were located in an area enclosed by walls, it is possible that the cobbled Wall 12 in Field XII.7 may have served such an enclosure function.

The third and earliest phase in Field XII has already been noted above in the discussion of EB IB remains. This included the mudbrick wall (Locus 12) in Field XII.4, fragments of the same in Squares 5 and 6, and possibly also Wall 7 in Field XII.7. During the next season it is planned to determine more exactly the nature of the earlier rectangular structure, as well as to examine more closely these lowest-phase remains belonging to EB IB. A number of new squares will also be opened, especially on the north, to establish the full extent of usage of this area.

Summary

The results of the 1977 season have greatly illuminated several features of the EB II-III city. The system of defensive towers is now apparent on both the northeast and west, while on the high southwest side the sacred precincts were possibly located. On the interior it is evident that the town embraced an impressive residential area with adjacent streets. Also beyond this area on the northwest were specialized buildings which may have been used for industries of several kinds, while the area also may have been used for residences.

A further problem involves the manner in which the EB III city came to an end. One possibility, which is suggested by the EB IV occupation built on the ruins of the city wall in Field XVI, is that it was the EB IV occupants who attacked the city. There is impressive evidence at various places that the EB III city was the object of a deliberate attack. This would include the massive pile-up of mudbrick in Field XIII, suggesting heavy destruction at this end of the city, and the large amount of burning in the Northeast Tower. On the other hand, the assignment of this destruction to the EB IV population is not yet conclusively proven, and this interpretation must continue to be tested against other possibilities. The parallel evidence in the cemetery area is also important in this regard (Rast and Schaub 1978: 22-24).

The Settlement of EB IV

A major objective of the expedition is to define the final major occupation of the site during the Early Bronze Age, the EB IV settlement. This phase is marked off by unique features which distinguish it from the phases of the walled city of EB II-III. That it is successive to the EB II-III city is clear from two types of evidence. First, the newly discovered remains of an EB IV occupation had been built over the ruined remains of the EB city wall on the north in Field XVI within the city. Second, the location of large complexes of the EB IV settlement are found outside the earlier EB II-III city. This latter fact had been determined during the 1975 season and was confirmed through further work in Field X by the 1977 expedition. Given this stratigraphic and locational break between the EB II-III and EB IV settlements, one of the critical problems concerning the cultural interpretation of Bab edh-Dhra is whether the EB IV peoples were the offspring of the earlier EB II-III peoples who came back to settle at the ruined site, or whether they reflect the injection of a new component into the southern Ghor population. The study of all facets of the EB IV cultural remains, as well as the artifactual and architectural evidence, is focused upon this problem.

In this report we must restrict ourselves to several significant results in Fields X and XVI during the 1977 season. The large numbers of pottery remains and the several objects from Field XVI are being prepared for the final report.

The greater amount of work in the northeast EB IV sector was devoted to Field X.3. In this square during the 1975 season, several mudbrick walls belonging to a residential unit were first discovered. During the 1977 season the structure was wholly uncovered and several floors associated with it clarified (fig. 27). The mudbrick structure was found to have three walls preserved, forming a rectangular house plan. The best-preserved walls were Wall 70 on the east and Wall 51 on the south. At the intersection of these on the southeast, the walls were standing to a height of three courses. On the west Wall 65 defined the same building, but gave indications of repairing activity in which the bricks were more carelessly laid in lengthwise fashion. Toward the north end of this same wall the bricks were replaced with stones. A further construction was Wall 73, projecting from Wall 70 and preserved a mere meter to the west. On its south side was a door socket which may, or may not, have been in situ. The entire north end of this building was badly eroded and could not be clearly delineated. A section of pavement (Locus 44) north of Wall 73 may point to a courtyard in this area.

The stratigraphy of the interior of the house

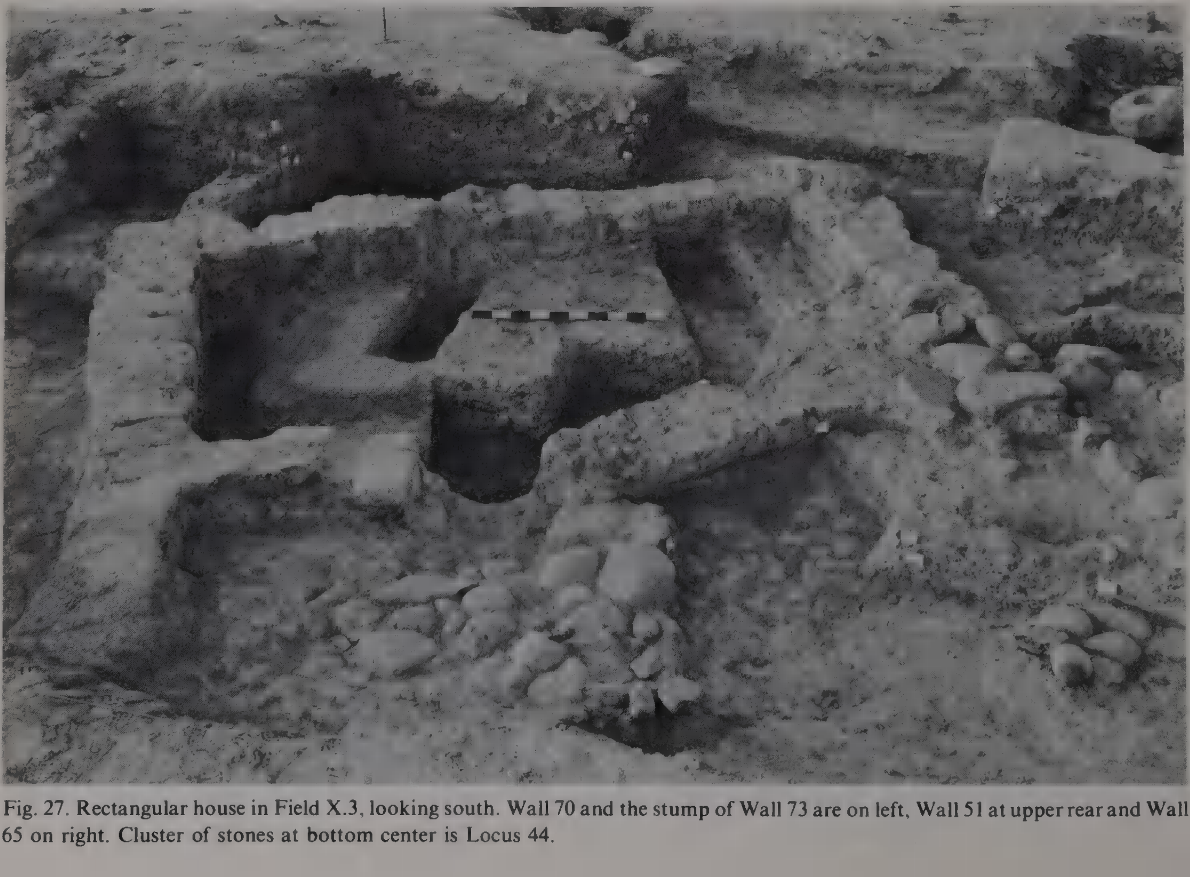


Fig. 27. Rectangular house in Field X.3, looking south. Wall 70 and the stump of Wall 73 are on left, Wall 51 at upper rear and Wall 65 on right. Cluster of stones at bottom center is Locus 44.

contained several layers. The lowest layer running below the house was of natural sand, belonging to the sandy layers which frequently interlace the natural marl of this area. As noted during the 1975 season, and on the basis of similar evidence found elsewhere at nearby places, the natural marl could not be built upon without treatment since it is extremely powderlike. Consequently above the sandy layer the EB builders laid a preparation of concretized marl and *huwwar* (Locus 61) which was found across the entire interior of the house. As discovered, it sloped considerably by some 30 cm from southwest to northeast, but this may have been due to erosion and settling activity in the area over the years. Above this concretized base were the main living surfaces of the house (Locus 60). Locus 60 consisted of several layered, loose, ashy surfaces within which were found many sherds and several broken mortars. The most interesting find, however, was the series of tabulate disc vessels designated as "hotplates" during the 1975 season (Rast and Schaub 1978: figs. 16-17). Several more were found in this house during 1977. Since abundant carbonized cereal remains were recovered by flotation from this same layer (Richardson and McCreery 1978: 55-56), it seems that the room was used for cooking and may even have been an early bakery. The roughly granulated baking discs in any case are a new phenomenon in the ceramic assemblage of EB IV, providing an insight into the preparation of an important item of the diet of this people.

The exploration of the EB IV occupation in Field X, then, has yielded important results for this phase. Since at least four subphases have been defined previously in this area (Rast and Schaub 1978: 17; Johnston and Schaub 1978: 33-35), the field has produced important pottery sequences for the EB IV phase which can now be tested against data obtained from other areas. The results in Field X have also shown that the EB IV settlers made heavy use of this area to the northeast of the ruined EB II-III city. This may have been because of certain advantageous conditions of this area, especially its proximity to the water supply in the wadis below, and also because of the cool breezes which blow from the north and west over the higher elevations of Field X.

Of special importance during the 1977 season was the discovery in the new Field XVI of an EB IV structure superimposed upon the mudbrick wall remains of the earlier EB II-III city. Since the trench of Field XVI was a very limited one, no clearly definable structure emerged. One wall (Wall 9) appeared, however, which must be dated to EB IV on the grounds of the associated pottery. This was a single wall, oriented north-south. It had been laid over the earlier mudbrick city wall (Wall 18). At one point a compact green, sandy and plasterlike material abutted Wall 9 and was apparently the major laid surface for this structure.

Above Locus 5 was an extensive locus described as decayed, gray mudbrick material found over most of the square (Locus 7). This locus seemingly contained both the collapsed remains of the building and some of the occupational remains of the EB IV occupants in its lower levels. Since the layers were extremely powdery along this northern area it was not possible to determine an exact series of living surfaces apart from the basic surface of Locus 5. But, interestingly, much of the material attributed to Locus 7 in different parts of the trench contained ceramic material belonging to the EB IV phase. In addition, among the many sherds were several examples of nearly whole EB IV forms, as well as several objects. The objects found in this area may all have belonged to the EB IV horizon, although in several cases they could have originated with the late EB III levels of the city below. These include the two metal objects (reg. nos. 1256, 1257), a potter's tournette made of clay (reg. no. 1258), a schist or slate palette (reg. no. 1262), several stone and bone beads, and a bone needle (reg. no. 1365).

It is still too early in the study of the EB IV phase at Bab edh-Dhra to be certain concerning its main features and its significance in the cultural history of the site. It appears, however, that the EB IV horizon is not a simple extension of the preceding phase of EB II-III. There is an occupational break between the two cultures as indicated by the location of the later settlements outside the previous city, and sometimes over them as in the case of Field XVI. This evidence coincides with that from the cemetery, where a different burial tradition corresponding to this phase is found. Only two (A52, A54) tombs dating to EB IV have thus far been located at the cemetery (Schaub 1973; Rast and Schaub 1978: 30). Over against the normal large charnel houses of the city period these EB IV tombs are a new type of larger shaft tomb, usually employing primary burial but with successive interments causing displacement of earlier burials. The shaft of the EB IV tombs is also usually lined with stones around its wall almost to the very top.

These features point to a degree of novelty beginning with the EB IV. At the same time the Field X.3 house shows a persistence of the basic EB rectangular building type into EB IV, and similar examples were discovered in Field IX during the 1975 season (Rast and Schaub 1978: 21-22). Thus some evidences of affinity with EB II-III are implied in the architectural tradition. It is to be hoped that as further stratified data from this period are obtained in a future season we may be able to resolve the nature of the EB IV horizon in the general Early Bronze Age sequence of cultures.

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Settlement at Numeira

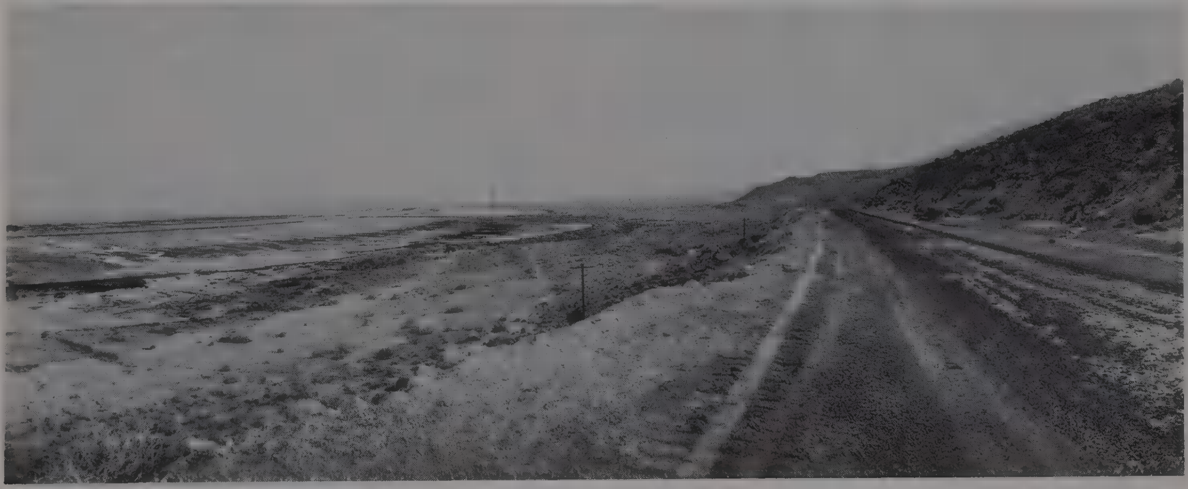
WALTER E. RAST

The second site at which work has been conducted by the expedition is Numeira, located 13 km south and slightly southwest of Bab edh-Dhra (fig. 1). Numeira is nearly 70 m lower in elevation than Bab edh-Dhra, but this is not reflected in the degree of discomfort during the heat of summer experienced at the two sites. The white Lisan marl and desert pavement around Bab edh-Dhra give off a brilliant reflection of the sun which often becomes unbearable, while at Numeira the predominance of natural Nubian sandstone and sandy gravel provides a somewhat more pleasant setting.

The site of Numeira was smaller than Bab edh-Dhra, having encompassed little more than 1 hectare (fig. 2). The alluvial fan on which the EB walled settlement was built is an aging deposit of conglomerate having eroded off the hills which rise up steeply to the Transjordan plateau to the east. This fan stretches out as the last outflow adjacent to the plain next to the Dead Sea at this point. In this regard it is similar to Bab edh-Dhra, although the Bab edh-Dhra settlement was located two fans back from the plain on the west. The plain at Numeira is also narrower and thus smaller than the Ghor at Bab edh-Dhra, which explains the lesser size of Numeira because of the diminished capacity of the surrounding fields.

In spite of the fact that several explorers had been to this area previously, the site of Numeira was identified as an EB site only in 1973 (Rast and Schaub 1974: 8-9). Its location next to the active spring outflow in the Wadi Numeira was striking. As a result of the discovery of this EB site so close

Fig. 1. General view of Numeira, showing alluvial fan on which site is located, looking north up asphalt road.



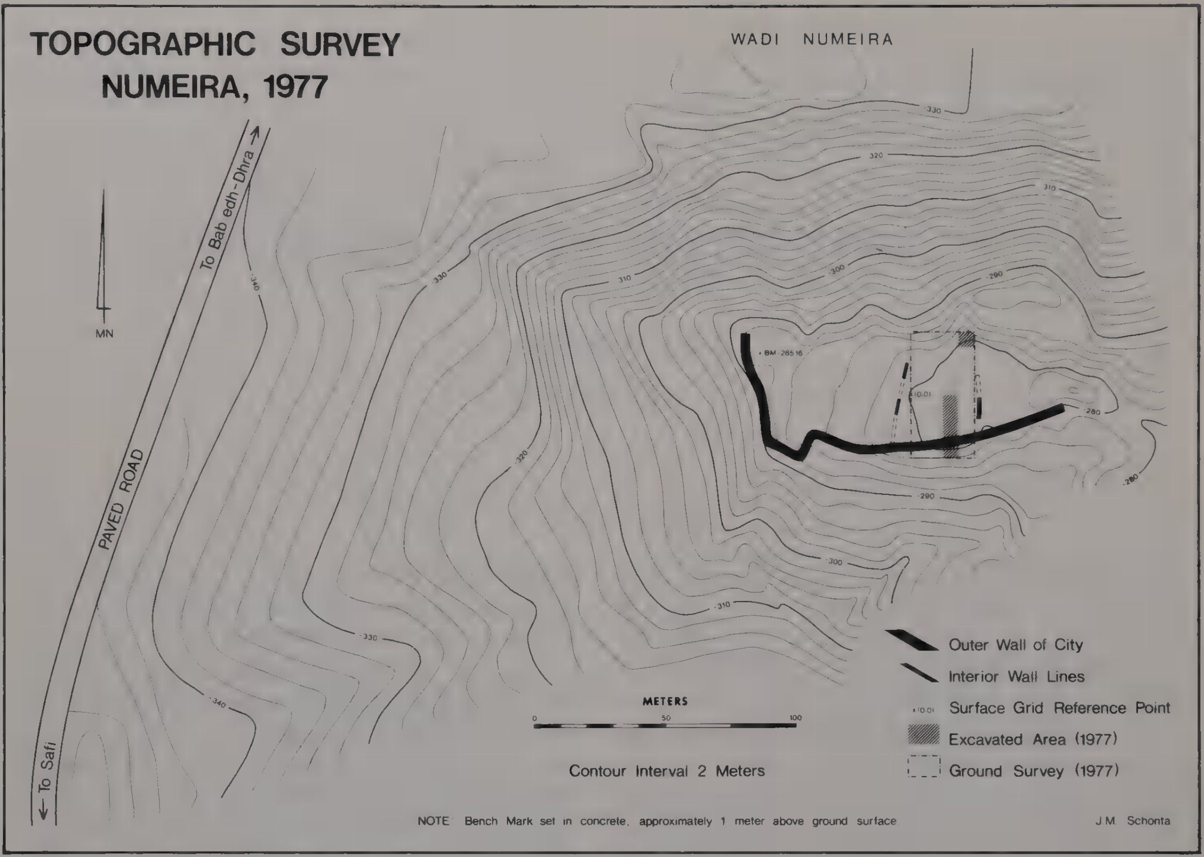


Fig. 2. Topographic map of Numeira.

to Bab edh-Dhra, as well as three other sites located similarly on alluvial fans next to the wadis south of Numeira, the present project was implemented.

The results of the 1977 work confirmed what was suspected at the time of the original discovery, during the survey of 1973, that Numeira was indeed an EB III site. It was destroyed by fire toward the latter part of EB III and was not settled thereafter. Given the destruction debris, which sometimes reached a depth of 1.5 m, the remains were unusually well preserved. Walls of structures were well defined in the areas cleared during 1977, and, although the pottery was not as plentiful as at Bab edh-Dhra, whole vessels were often preserved or could be reconstructed. Numeira offers an ideal opportunity to recover the plan of an EB III town with great accuracy and without heavy demands in terms of cost and time. In addition, it is an ideal site for data on the interlocking of environmental and settlement features.

The work done during 1977 consisted only of a limited exploration. Since the main energies of the expedition were concentrated on the town and cemetery of Bab edh-Dhra and on the continued exploration of the immediate environment of that site, Numeira was planned as a preliminary and exploratory work. Two excavation teams were consequently assigned this site. The decision was made to plot a series of squares across what is almost the middle of the site (fig. 2). This trench would cross the southern defense wall, putting that wall under exploration at a point which, from surface observation, seemed promising. It was also assumed that these exploratory squares would provide evidence of both the stratigraphy inside the town and the nature of the settlement.

Differing from Bab edh-Dhra, whose extensive scattered remains have necessitated a system of fields tied to an absolute reference point, the smaller site of Numeira was divided into four quadrants, abbreviated NE, NW, SE, SW (northeast, etc.). Two Arabic numbers separated by a slash line are used to give the specific square location on the grid. The first number is oriented to the east-west line of the grid, while the second is north-south. Thus in SE 3/1 the 3 refers to three squares over to the east from the north-south line across the site, while the 1 refers to the first square to the south of the east-west line bisecting the site. The squares opened in 1977 included SE 3/4, 3/3, 3/2, 3/1, and NE 3/1 (fig. 3).

City Wall

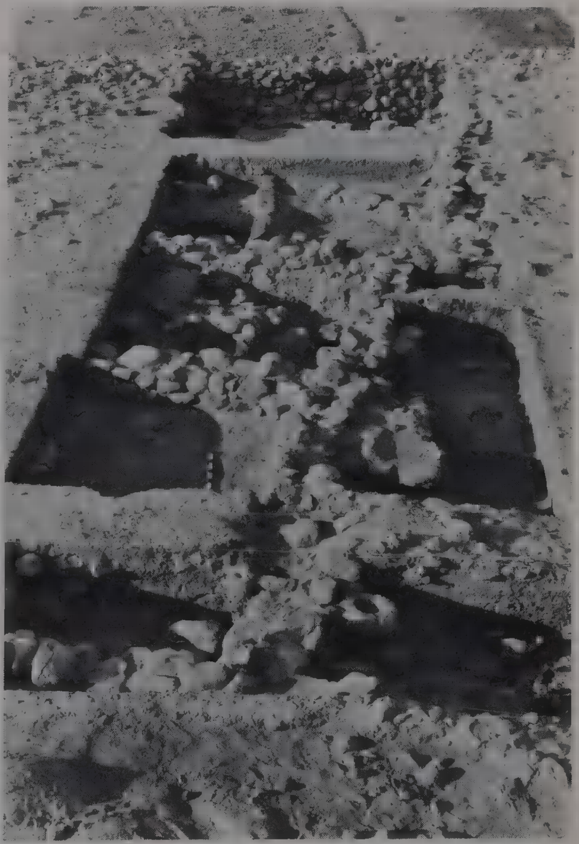
The entire town site of Numeira in antiquity was ringed by a defensive wall. Much of the foundation is still evident on or below the surface, especially on the south and west. On the north the ground survey showed that erosion has taken most of the northern wall into the wadi below (fig. 2). Indications are that this activity against the northern wall was relative recent, suggesting that further erosion will take place on this end of the city which now lies unprotected. On the east the line of the wall could not be discerned, but what seem to be the remains of a tower are found here.

A walk across the surface remains of the city wall shows that the stones were of local Nubian sandstone. These were collected off the slopes east of Numeira and from the wadi below. The section investigated in 1977 was located in Squares SE 3/4 and 3/3. Here the wall was preserved to a height of a little more than 1 m with seven courses of stones still in position. On the exterior the footing was put down on a natural gravel and sand base. Large, boulder-sized stones with pebbles placed between were used for the lower part of the exterior face, and this is apparently the situation around the entire south end (fig. 4). In a section taken against the wall on the south side much burnt ash and large pieces of charcoal appeared, coinciding with evidence of destruction debris in the interior.

The interior wall exposed in SE 3/3 also used a combination of larger with smaller stones but does not seem to have employed the boulders found on the exterior of the wall (fig. 5). In the section investigated the wall measured approximately 4 m in width, a fair size given the small dimensions of the Numeira site.

Longitudinal sections within the core were an unusual feature in this part of the wall (fig. 6). On the plan these inner, secondary wall lines are given individual locus numbers together with the exterior and interior faces. Thus Locus 3 is the exterior wall, Locus 7 is the interior face, while Locus 8 and Locus 6 are the inner face lines (fig. 7). In the area opened the problem of whether the entire width of the wall belonged to one phase, or whether the original defenses were strengthened by adding a section of wall on the interior could not be solved. One possibility which needs to be examined further is that Loci 6 and 7 were added as a strengthening device in a later phase of wall construction. These latter two sections in any case were higher than Loci 3 and 8. If, however, the two components of the defenses were contemporary, then the wall may have been built by laying a series of parallel walls, the cavities between which were filled with smaller and larger stones randomly laid. This technology of wall construction is interesting to compare with that at Bab edh-Dhra, where the method of transverse sectional construction has been observed (Rast and Schaub 1978: 10). It may be that the smaller size of Numeira did not induce the ancient builders to employ the latter technique as was the case at its larger neighbor to the north. Nonetheless, the wall was built with great strength, the inner, parallel walls having provided excellent

Fig. 3. Squares excavated at Numeira during 1977, looking south with city wall inner face in background.



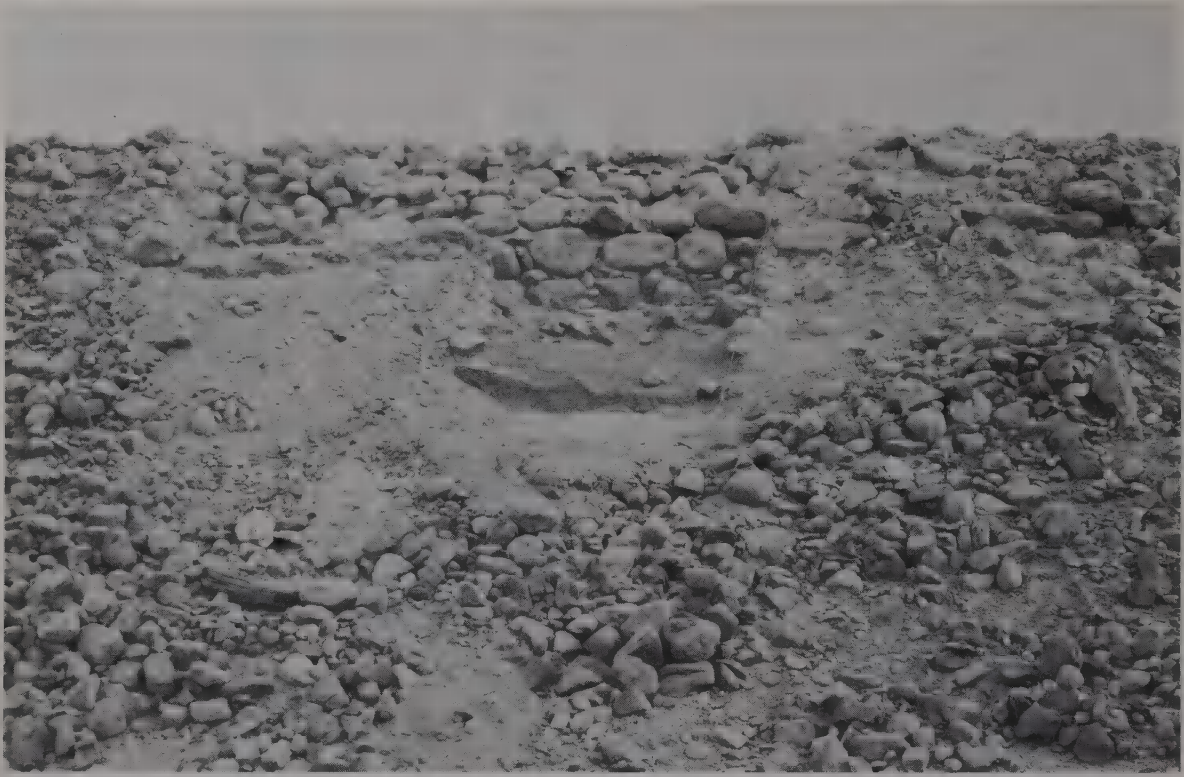
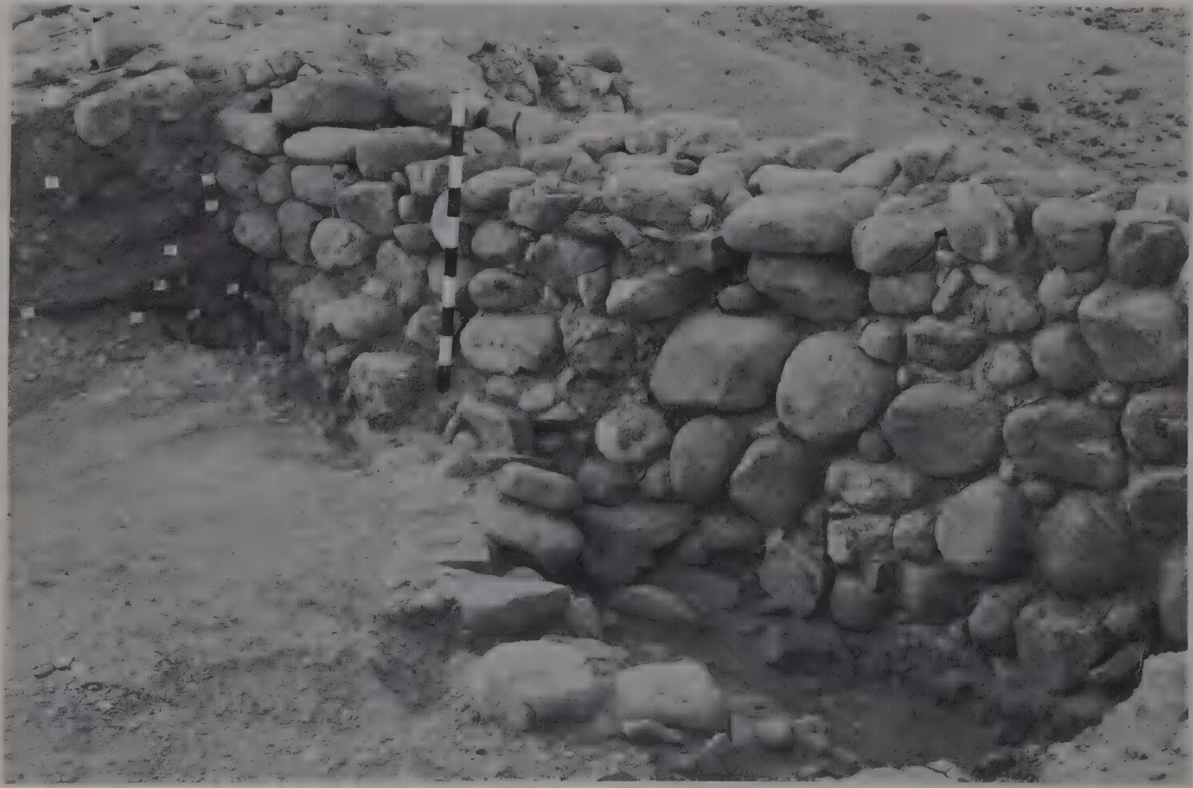


Fig. 4. Exterior face of city wall on the south with trench cut against the wall, looking north.

Fig. 5. Interior face of city wall on the south, looking southeast with Wall 33 projecting from the city wall.



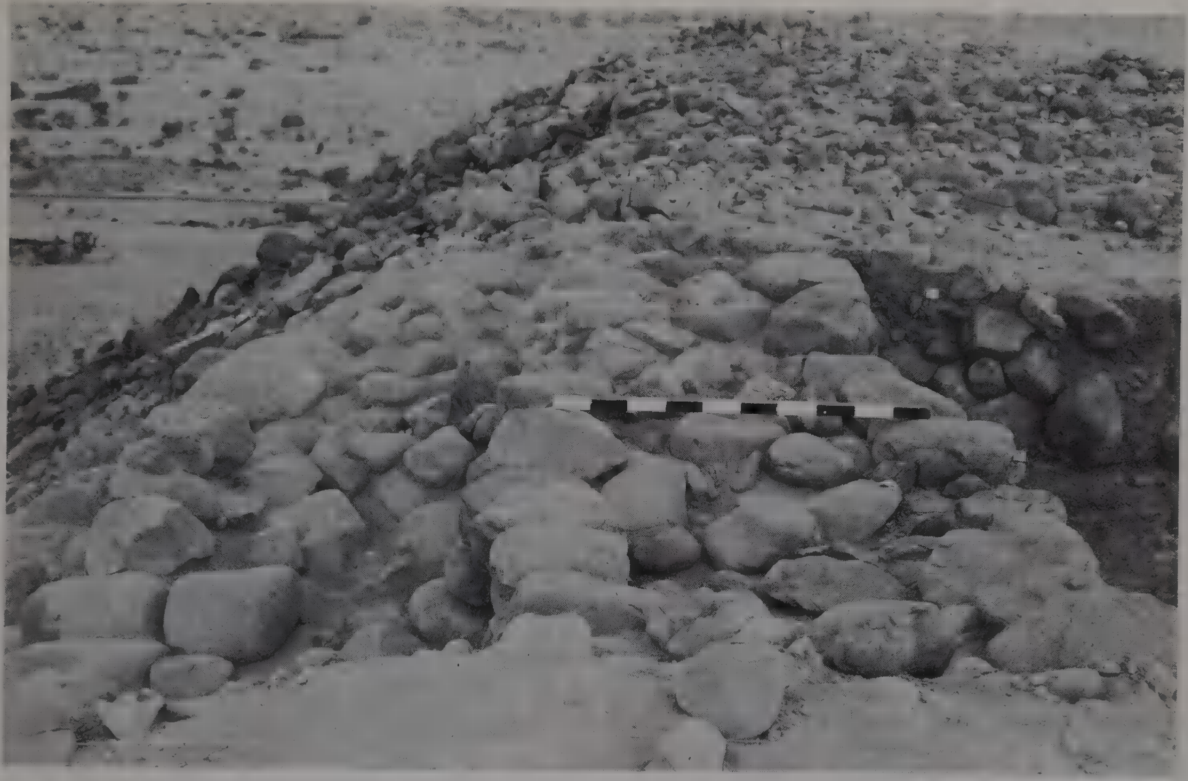


Fig. 6. City wall on the south showing lengthwise segments.

reinforcement, whether built all at once or in two phases.

Whether the defensive wall also had a superstructure of mudbrick is questionable. No conclusive evidence was found one way or the other in SE 3/3 and 3/4. The fact that several mudbricks were discovered within the city to the north in SE 3/2 suggests that mudbrick was employed at the site. On the other hand, it is apparent that considerable stone material has fallen off the city onto the slopes of the south side which are covered with stone rubble from the wall above. This may suggest that a large part or even the entire wall was composed of stone and that the use of brick was not employed at all.

Intramural Settlement

In the squares excavated a series of rooms with a common orientation appeared to the north of the defensive wall. Though not a straight north and south feature, Wall 4 in SE 3/3 lines up with the walls which continue in a northerly direction (fig. 7). These walls are all 2 rows wide, and they show that the major axis was north-south. Forming angles with this wall was a group oriented mainly northwest-southeast, including Locus 33 in SE 3/3, Locus 14 in SE 3/2, Locus 6 in SE 3/1, and Locus 8 in NE 3/1. Wall 41 in SE 3/1 and Wall 16 in NE 3/1 suggest that similar crosswalls lead off to the west of the major north-south wall, and that more of these may come to light in future excavation.

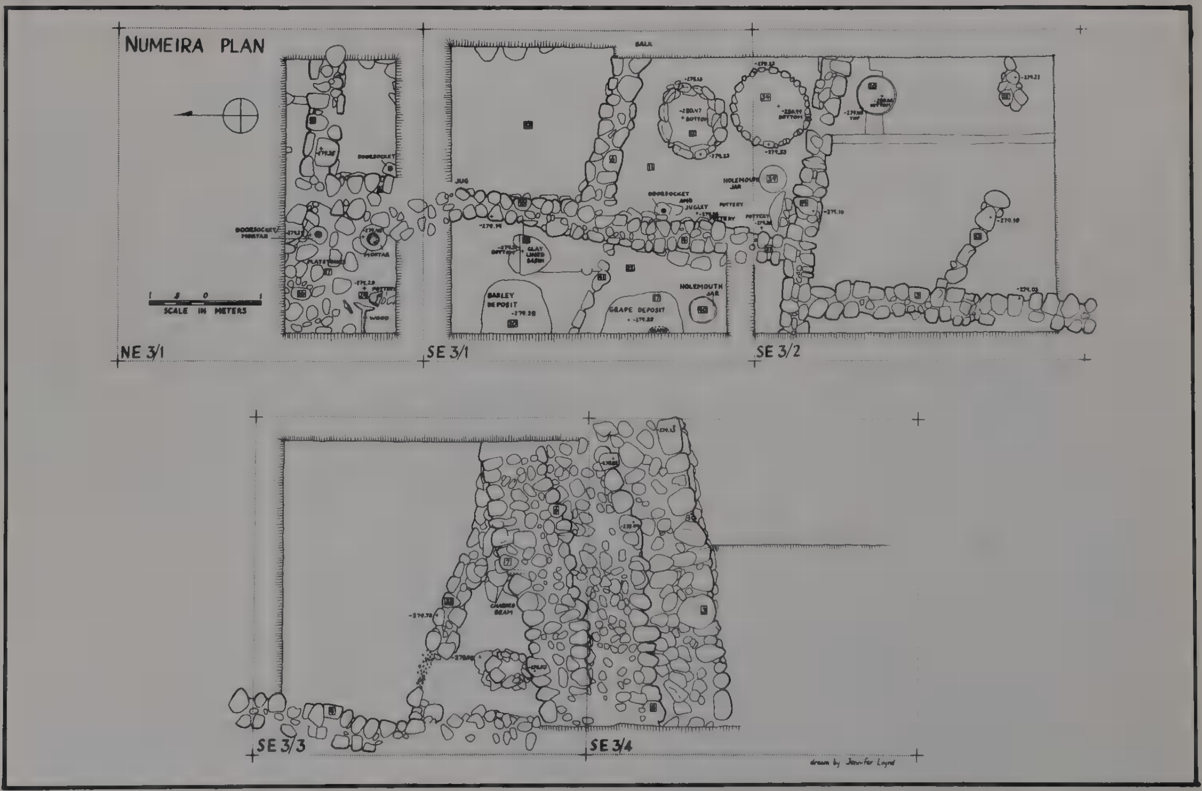
In two cases the appearance of door sockets seemingly in position indicates that we are dealing with enclosed rooms possibly used as residences or for industry or for a combination of these. The door sockets can be seen south of Wall 8 in NE 3/1 and south of Wall 6 in SE 3/1. These two are in similarly constructed rooms. Within the rooms were various examples of large stones with hollowed-out holes, probably mortars. Two stone-lined storage pits (Loci 12, 34) appeared in the rooms in SE 3/1 and 3/2, while a curious clay installation (Locus 20) was exposed in SW 3/2. Since the rooms were filled with ash deposit, a number of wholly preserved or restorable remains came to light.

Although much of the evidence suggests a single phase of usage, there was some evidence of a possible earlier phase prior to the main period of the town. This problem was raised in a crucial way at the point where Wall 33 joins the defensive wall (Locus 7) in SE 3/3. At this corner on the southeast end of Square SE 3/3, it was discovered that there was no simple junction between Cross-wall 33 and the defensive wall. Rather, the larger stones of the defensive wall were laid over Wall 33, while the latter ran underneath the defensive wall (fig. 5). The foundation trench (Locus 36) for Wall 33, which had cut into the pebble bedrock, was also determined. This was traced for 3.5 m along the wall to the west. It appears, therefore, that Wall 33 may have been somewhat earlier than this part of the defensive wall and that, when the latter (Locus 7) was constructed, some adaptation had to be made in the defensive wall at the point where the city wall met Wall 33. It is noteworthy that the stones in the defensive wall were somewhat smaller and rougher where the intersection with Wall 33 was made, as over against the larger, rounded sandstones found to the west of this juncture (fig. 5). Future excavations should show whether Wall 33 abuts an earlier section of the defensive wall, to which the later Locus 7 was then added. Were this evidence to come to light, it would clarify the problem raised above concerning the several longitudinal sections of the wall.

Lending support to an earlier phase was the stratification within several of the rooms. In SE 3/3 and 3/2 appeared a layer of brown soil very near bedrock. From this layer a series of pits had been cut, especially in SE 3/2 where six were isolated. In relation to one of these, Pit 39 in SE 3/2, a broken, holemouth vessel was discovered. In addition to Wall 33 in SE 3/3, there was provisional evidence that the north-south wall line was established largely during this first phase, including Wall 4 in SE 3/3, Wall 3 in SE 3/2, and Wall 37 north of Wall 14 in SE 3/2. The east-west Wall 14 seems also to have been built in this first phase (fig. 7). Locus 22 in SE 3/3 was a living floor associated with this period, while the interesting Locus 20 may also have originated in this phase (fig. 8).

In a second phase several other walls were

Fig. 7. Plan of city wall and interior of city where excavated.



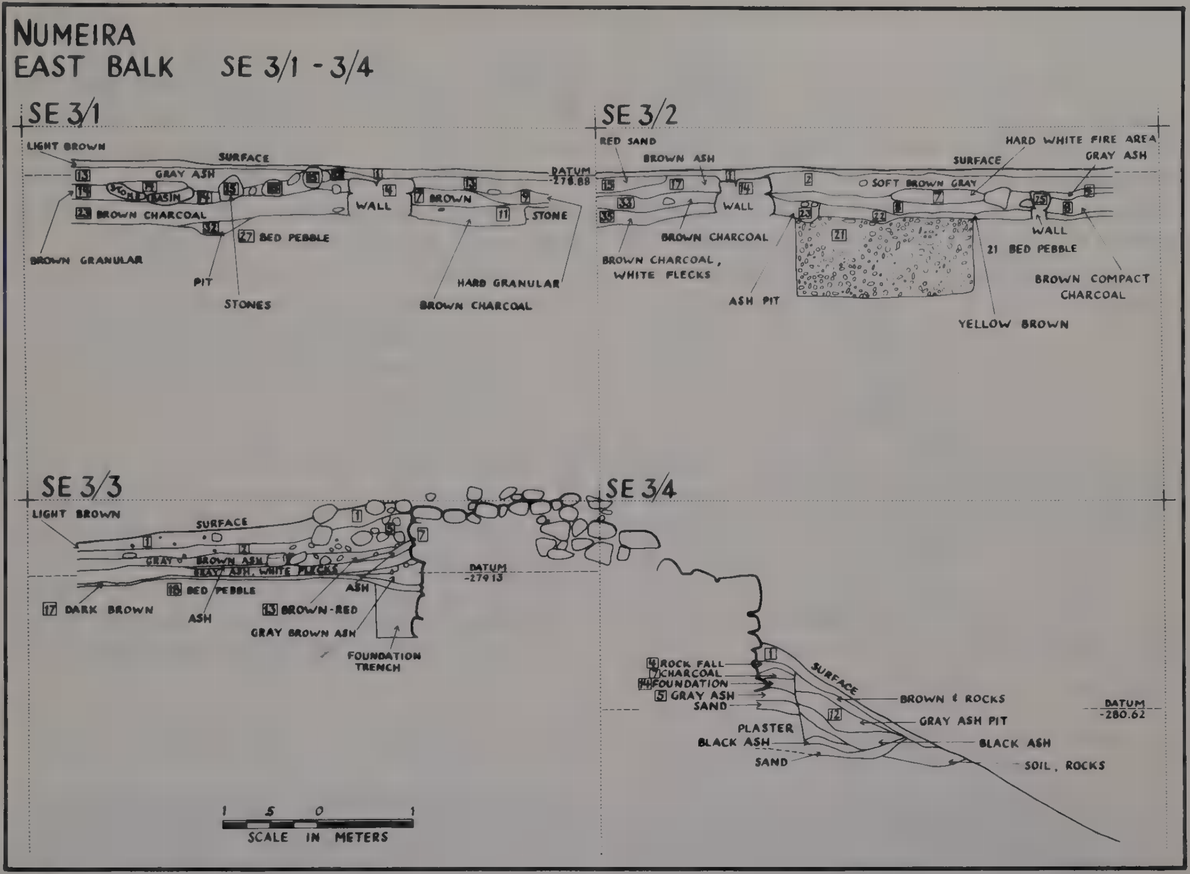


Fig. 8. East balk section at Numeira.

added, including Walls 13 and 25 in SE 3/2, and possibly also Walls 6 in SE 3/1 and 8 in NE 3/1. Also in this phase the stone-lined pit, Locus 34, and the pit of fine slabs, Locus 12 in SE 3/1, seem to have been constructed. Other installations such as Locus 20 carried over into this phase. This is, therefore, the main occupation of Numeira, whose remains were destroyed by fire at the end of the city period. Throughout all the squares there appeared a similar surface identified as this main occupational phase, Locus 10 in SE 3/3, Locus 8 in SE 3/2, Locus 32 in 3/1, and Locus 12 in NE 3/1.

While the layout can only be seen in a very limited way in the north-south trench, the remains in these squares suggest a series of rooms. As noted previously, these rooms were largely impacted with debris, much of it containing evidence for burning. In NE 3/1 were large pieces of burnt wood and ash, while in SE 3/1 clusters of barley (Locus 20) and grapes (Locus 17) were found in a confined area of the ash of Locus 22 (see pp. 165-69 below), a slightly later occupational surface above Locus 32. The remains of whole and restorable pottery in the ash also pointed to a general destruction of the site by fire.

Further study of the pottery from 1977 and future excavation of more of the site will be necessary to establish the relation between the destruction of Numeira in EB III and that at Bab edh-Dhra during the same period. It will be important to determine whether these two sites came to an end simultaneously and, thus, in connection with similar events, or whether their destruction took place at different times within EB III. What can be said at this stage of the investigation, in any case, is that the observation that the site was blanketed with ashy destruction debris based on the survey (Rast and Schaub 1974: 9) has been confirmed through excavation.

An additional observation is evident from the investigations of 1977. It does not appear that the occupation at Numeira extended over a lengthy period of time. Even with the prospect of an earlier phase of construction at the site, the time span during which the city was in existence seems not to have covered more than a century. There are no indications of occupation earlier than EB III. Again, closer examination of the pottery alongside the typologies of Bab edh-Dhra may help to decide whether the city was built toward the early, middle, or later part of EB III, and at what time during this general period its occupation was terminated.

Objects and Special Installations

A number of important objects and installations appeared in the destruction debris of the rooms at Numeira, several of which have been noted above. The two storage pits, Locus 34 in SE 3/2 and Locus 12 in SE 3/1, were adjacent to each other but constructed of quite different stone material. Locus 34 was made from smaller cobble-sized stones while Locus 12 consisted of vertically positioned large slabs (fig. 9). The bottom of Locus 34 was lined with a hard brown clay, while toward the bottom of Locus 12 some chunks of mudbrick were also found. The base may thus have been made intentionally of hard clay, while there is evidence from some desiccated bricky pieces that a sealant had been used around the large slabs. Locus 34 was approximately 1.20 m deep, while Locus 12 was 1 m in depth.

A parallel to Locus 12 may be present in Room 222 of the EB city at Ai (Marquet-Krause 1949: pl. 34:1). This installation was designated a kiln or oven (*four*). It was constructed of slabs laid about in a circle just as the Numeira example. This is a suggestive interpretation also for the Numeira structure. In the excavation above the latter a lens of red sandy soil filled with ash was discovered (Locus 2). There were also pieces of a clay, slaglike material nearby, examples of which are being examined by the ceramic technologist. A number of slabs and boulders had also fallen into Locus 12, suggesting that the installation might have been higher than it was preserved at the time of

Fig. 9. Pits 34 and 12, looking west with Wall 14 to left and Wall 4 in rear.

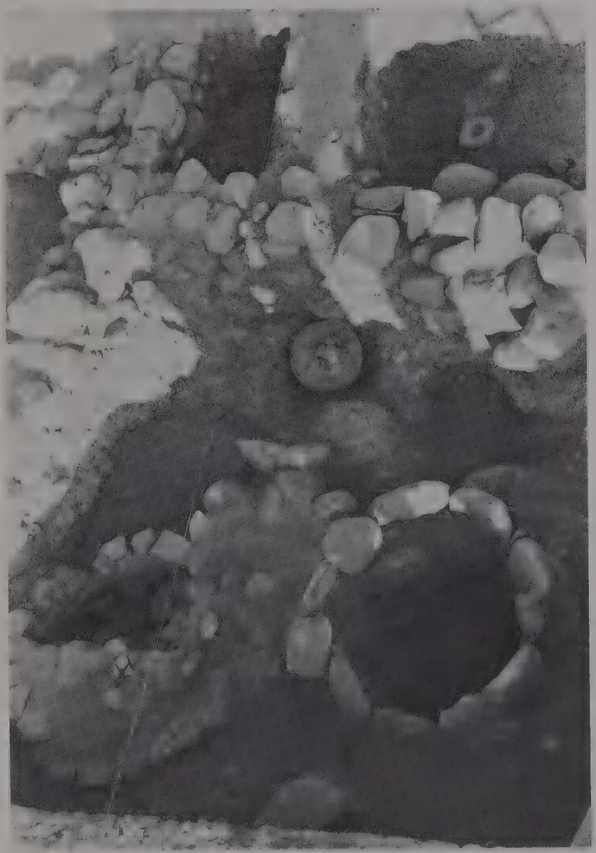
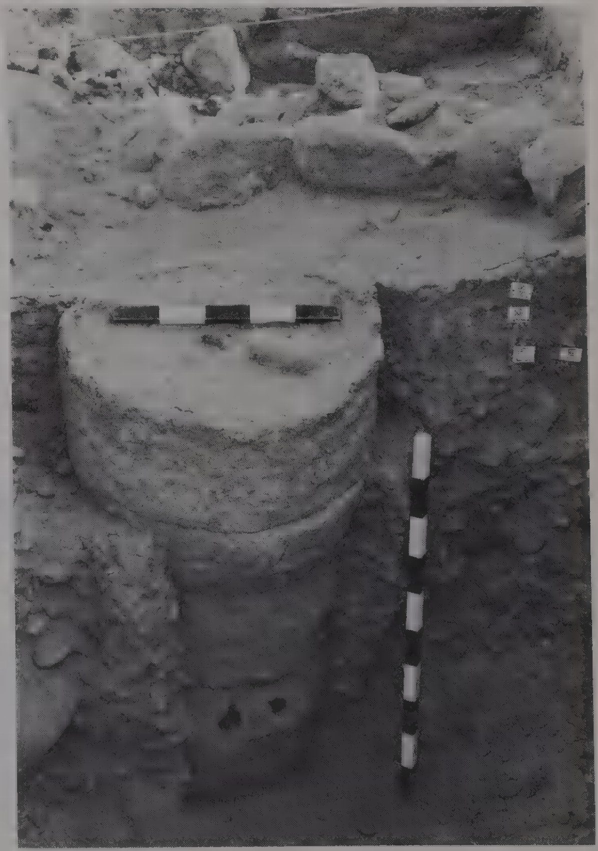


Fig. 10. Clay storage container (Locus 20), looking north.



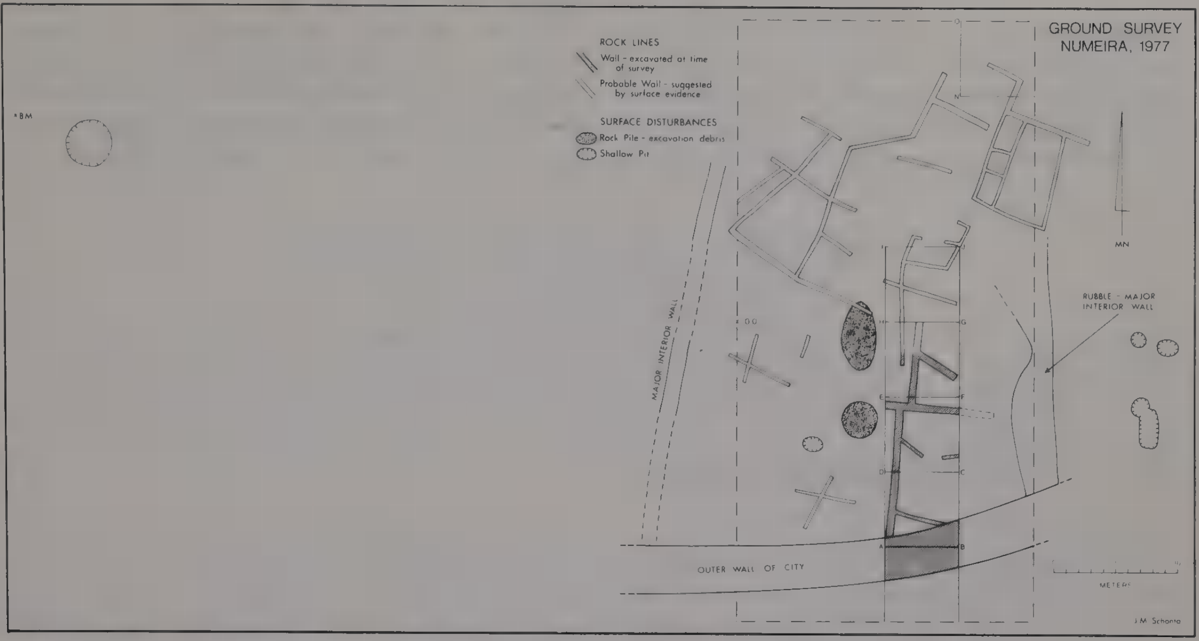

GROUND SURVEY
NUMEIRA, 1977
ROCK LINES
Wall - excavated at time of survey
Probable Wall - suggested by surface evidence
SURFACE DISTURBANCES
Rock Pile - excavation debris
Shallow Pit
BM
MN
RUBBLE - MAJOR INTERIOR WALL
MAJOR INTERIOR WALL
OUTER WALL OF CITY
METERS
J.M. Schonto

Fig. 11. Plan based upon the Ground Survey.

excavation. An installation for some type of fire activity, perhaps for pottery making, may not be out of the question. On the other hand, Locus 34 was probably a storage pit. Soil samples were taken from both of these installations, as well as from Locus 20, and have been put through the flotation process (see pp. 165-69 below).

The most unusual discovery during the 1977 season at Numeira was the ceramic installation, Locus 20 in SE 3/2 (fig. 10). When first discovered at the living surface (Locus 8), it appeared to be a *tabun*. Continued excavations, however, showed that it had been planted down into the pebble bedrock and that its total depth was 1.17 m. It was built in 5 sections, the smallest being the bottom which was partly curved but with a flat bottom. The second from the bottom section had two apertures with the shapes of rough triangles. When the interior was later cleaned out, no further openings appeared around the sides. The third from the bottom section was wider, while the two upper sections were of increasing diameter, the upper section being the widest. The diameter of the mouth of Locus 20 was between 0.70 and 0.74 m and almost perfectly circular.

On the interior there was little evidence to suggest how Locus 20 functioned. Toward the top the soil was fine brown with a few small stones. At a lower level pottery sherds were present along with some bone and charcoal. A bone implement (reg. no. 1304), identified as an awl (see pp. 181-85 below), came from within Locus 20. Toward the bottom a heavy stone and a flint appeared. The search for parallels has brought no satisfactory results which could set this installation into a meaningful framework. Its use for anything to do with burning seems not to have been likely since there were no signs of combustible activity. More probably it was used for some kind of storage, but clear definitions of the latter are not yet possible.

A further object of significance was the large part of a broken storage jar with a seal impression (reg. no. 1301) around its shoulder. The pieces of this jar, including several with the impression, were found in Locus 11, a surface around the Locus 12 installation of SE 3/1.

The well-preserved finds at Numeira are typical of destruction levels at archeological sites. It is remarkable, for example, that the grapes in Locus 17 of SE 3/1 were preserved even with their outer skins, due perhaps to the burning material which collapsed over the area and sealed these items, as it did also the batch of barley in Locus 20. It is to be expected that further items of importance will appear in a larger exposure at Numeira during a future season. Above all the site promises a complete plan of a small EB III city, and the spatial arrangement of this site in comparison with that of Bab edh-Dhra during the same period should result in some significant comparisons. This has already become evident in the interesting constructional pattern which emerged in the ground survey of the interior of the Numeira site conducted during 1977. Evidence seems to be present already on the surface of a residential type which coupled a large open court or room with smaller rooms built off to one side (see the north part of the Ground Survey, fig. 11).

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Part Two: Burials

Patterns of Burial at Bab edh-Dhra

R. Thomas Schaub

Excavations in the cemetery at Bab edh-Dhra have been renewed on a large scale in order to advance the results of previous excavations, particularly in the knowledge of the sociocultural patterns. The new data sought are twofold. First, skeletal material is being retrieved in sufficient quantities to permit new in-depth studies of the possible relationships of the successive populations buried in the cemetery. Second, burial patterns and the distribution of tombs of all types throughout the cemetery area are being explored more fully.

The field strategy developed to meet these concerns included concentrated excavations in the well-known areas of the cemetery and soundings and explorations in newer areas. Certain fields excavated under Lapp's direction in 1965-67 had yielded intact chambers with well-preserved skeletal remains. In returning to the same areas we hoped to have similar results in the most expeditious manner. Soundings in the unexplored areas were intended to determine more clearly the distribution of tombs throughout the cemetery. Our primary efforts in both old and new areas were focused on the discovery of shaft tombs. Two charnel houses, however, were excavated during the field season, both round in plan.

The most immediate result of the cemetery excavations is a greater appreciation of the gradual evolution in burial patterns from EB I into EB II. Several tombs provided "missing links" in both tomb types and ceramic typology, which suggests a possible step-by-step transition in sociocultural patterns rather than sudden changes of a wholesale mixture or clash of different cultures. The changes appear to manifest adaptation by related population groups to a more permanent settlement at the site.

The following preliminary report traces changes in burial patterns from EB IA through EB IB to EB II. The presentation begins with the earliest phase EB IA and ends with the latest material excavated in the cemetery during 1977, that of an early EB II tomb. The areas explored (see fig. 1) include: (1) Cemetery A, which is closest to the town, the largest and apparently the most extensively used area of the cemetery; (2) Cemetery C, located on the last ridge at the northwest edge of the cemetery before the descent into the Ghor; and (3) Cemetery G, located between Cemeteries A and C and explored for the first time during the 1977 season. The presentation here focuses on tomb location and architecture. The human remains are discussed below by Ortner, following the same order as here.

A total of 16 shaft tombs with 38 associated chambers and 2 round funerary buildings were excavated during the 1977 field season. An additional shaft tomb with at least two chambers was excavated during the winter of 1978. Over 900 complete ceramic vessels and objects from these tombs were registered.

The EB IA Tombs of Cemetery A

Tombs A 78, A 79, A 80, A 100 (E. W. S.), A 101.

One area explored during the 1977 season was at the south extremity of Cemetery A (fig. 1). Here the well-preserved remains of Tomb A 76 (Lapp 1968a) were discovered in 1967. The method

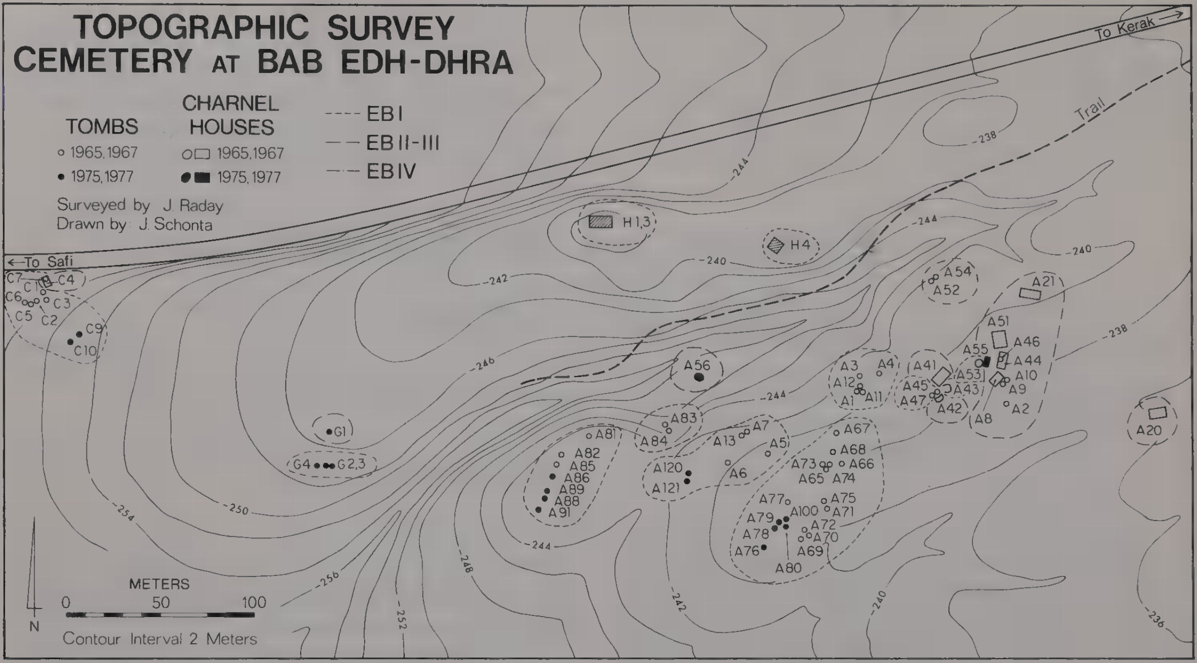
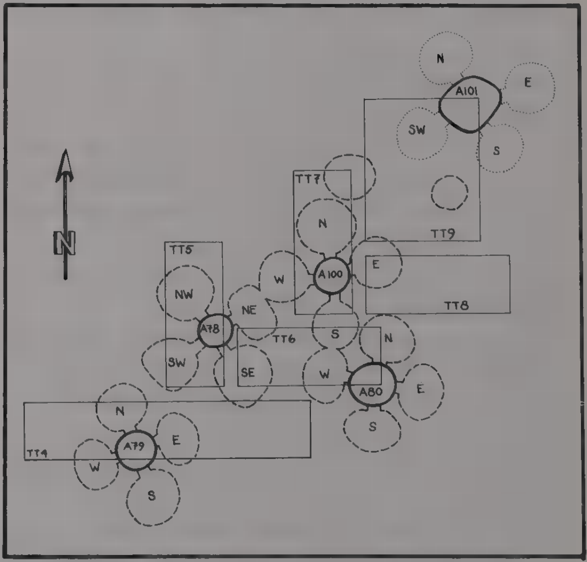


Fig. 1. Sketch contour of cemetery area with location of tombs excavated from 1965-78.

generally employed in the search for shaft tombs was to lay out a 2 × 5 or 10 m trench and to excavate carefully the upper soil layers. Filled-in shafts in the area were revealed through differences in soil color, shaft outlines, or breaks in the natural stratigraphy represented in the balks of the trenches. Of the nine trenches opened in this area five revealed shafts, each of which led to four chambers. The relationship of the test trenches and Tombs A 78, A 79, A 80, A 100, and A 101 is illustrated in fig. 2. The close positioning of the shafts and their underground chambers demonstrates the extensive use of this area of the cemetery.

The proximity of these tombs to each other raises the question of the degree of planning involved. Tombs A 78, A 79, and A 80 were spaced with the shafts at nearly uniform distances of 5.5-6.0 m apart. Tomb A 100, the latest tomb, was at the shorter distance of 4.5 m, almost equidistant from A 78 and A 80. As a result two of the chambers of A 100 cut into nearby chambers, the south chamber of A 100 into the west chamber of A 80 and the west chamber of A 100 into the northeast chamber of A 78. Despite this slight miscalculation, (only 11 cm separated the inner walls of A 100 W and A 78 NE at one point), it seems that the tomb cutters were aware of the position of neighboring tombs. The shaft outlines still could have been noticeable during the use of the cemetery (see pp. 119-32), and they may even have been marked. Another possibility is that the shafts could have been left open or partially filled for an indefinite period of time. The positioning of the shafts also seems to imply a regular pattern. Whether the pattern was a straight line (A 80 to

Fig. 2. Plan of southern area including test trenches and location of Tombs A 78, A 79, A 80, A 100, A 101.



A 100; A 78 to A 79), or a curved line through A 78, A 79, and A 100, following the ridge, is not certain (Lapp 1968: 6).

Tomb A 78 provides a good example of the typical features encountered in the shaft tombs. The photo of the early excavation of the shaft (fig. 3) illustrates how the shaft was originally cut in a wide circle from very near the present surface. Allowing for the wind erosion which produced the present desert pavement, the EB surface was probably several centimeters higher. When more stable layers of cobble, limestone, and marl were reached, the shaft was narrowed, taking more cylindrical form.

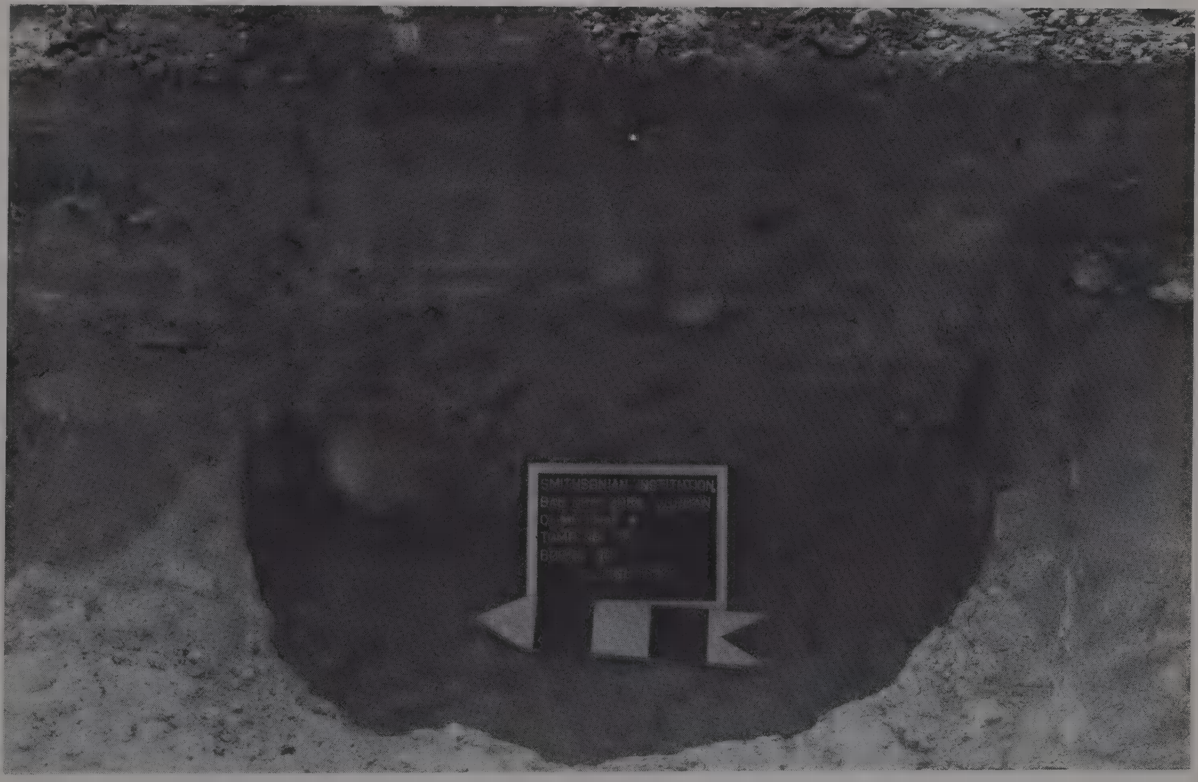
The diameter of the shafts in this area varied slightly from 1.20-1.30 m. Shaft depth seems to have been dependent, at least in part, on the natural stratigraphic layers which could be cut into most easily for the chambers. The depths varied from 2.25-2.85 m. The shaft fill usually consisted of a mixture of marl, gravel, and some small boulders. Scattered cultural and skeletal material, including beads, sherds, flint fragments, and bone and teeth fragments, were found in the fill. The depression at the top of the shaft (fig. 3) indicates that fill material settled and eventually filled up with rain- or wind-borne deposits.

Four large blocking stones, sealed in place by mud mortar and smaller stones, were in position before the doorways of the chambers of A 78. The entryways were oval shaped, ranging from 0.45-0.60 m maximum width and height. The base of the entryways was usually level with, or slightly above, the shaft floor (fig. 4).

Ceiling collapse had occurred in the northwest and northeast chambers of A 78, the latter chamber having the heaviest amount. The southeast chamber was the only chamber of this tomb which had an appreciable amount of silting (0.04 m). It was also the least effectively sealed since gaps occurred in the mortar around the blocking stone.

A comparison of the irregular patterns of silting in the other chambers of this group of tombs is instructive. Tomb A 79 had two chambers with moderate to extensive silting and two chambers completely silted. The chambers of A 80 showed the most variation with accumulations of silt ranging from a slight amount to 0.05, 0.15, and 0.50 m. Tomb A 100 had the best-preserved

Fig. 3. Early stage of excavation of shaft of Tomb A 78.



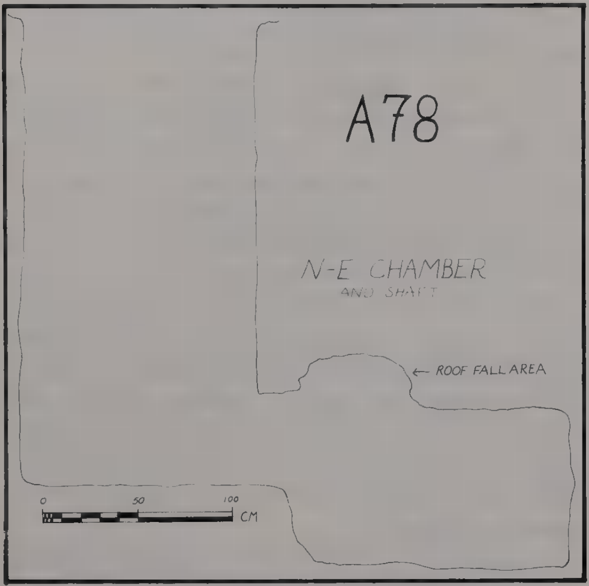


Fig. 4. Section drawing of NE chamber and shaft of Tomb A 78.

chambers with only the west chamber containing slight silting. All of the silting took place after the burials and artifacts had been placed in the chambers. Although other conditions explaining the silting may be possible, it seems that the effectiveness of the seal around the doorway was the most influential factor. The north and south chambers of Tomb A 79, with moderate to extensive silting, both contained blocking stones, even though they were poorly sealed. The east and west chambers, completely silted, had no blocking stones or mortar seal. In Tomb A 80 the blocking stone of the west chamber, with 0.50 m of silt, had fallen away from the opening, leaving a sizable gap. The south and east chambers, with slight silting, were again the best sealed. Tomb A 100, in addition to well-sealed entryways, had a hard mortarlike fill in the bottom third of the shaft, which was no doubt a contributing cause to its excellent state of preservation.

In one case, however, the silting evidence helped to determine the relation of two tombs and their chronological positions with respect to each other. The original floor levels of Tomb A 100 S, the chamber which cut into A 80 W and A 80 W, were approximately the same. The west chamber of Tomb A 80, as previously noted, had 0.50 m of silt while A 100 had no silting accumulation. The opening between the two chambers, which occurred when a later tomb cut into an earlier one was 0.5 m wide and extended from floor to ceiling. Two large stones to block the unanticipated opening in antiquity were placed on top of the silt level in Tomb A 80 W. Thus it can be concluded that the latter was silted in before A 100 S was cut.

There seems to be no simple explanation for the separate question of how the silting occurred. In some cases water may have seeped through cracks in the ceiling, also causing roof-fall. This seemed to be the case if the chamber was fairly close to the surface. In other examples the silting apparently occurred through the shaft. The shaft-fills at present are tightly compact but the upper depressions in the shafts show that the fill has settled over the centuries. Looser fill in antiquity may have allowed water to seep down in the less-tightly sealed chambers. But the quantity of silting in some chambers would seem best to be explained by water entering through an open or partially filled shaft. This would most likely have occurred during winter months with an occasional heavy rainfall. Although no uniform pattern can be determined, the silting evidence in some tombs suggests that shafts could have been left open or partially filled for a period of time.

Since there would be no reason to leave the shafts open if all chambers had been completed with burials, a further implication would be either that chambers from the same shaft were cut at several times, or at least that burials in the different chambers were made over a period of time. In itself the pattern of multiple chambers from the same shaft could be explained by references to the economy of time and labor, burying as many as feasible at a single time. But a further explanation could be offered, that EB IA family or clan groups returned periodically to bury the remains of their relatives by means of secondary interment. In doing so they used the same shaft and chamber complex. The possibility that the skeletal data may bear this out is being examined by the physical anthropologists.

The plan of Tomb A 78 (fig. 5) illustrates a pattern of skeletal material and tomb gifts now well known in the EB IA tombs at Bab edh-Dhra (Lapp 1968a: 14-26). The disarticulated bone pile is in the center or to the left of the entryway. Mat impressions are frequently found below the bone pile. In Tomb A 78 NW the fragile remains of actual reed fragments of a mat were discovered intact (fig. 6). The skulls are almost always found to the left of the bone pile. Pottery and other

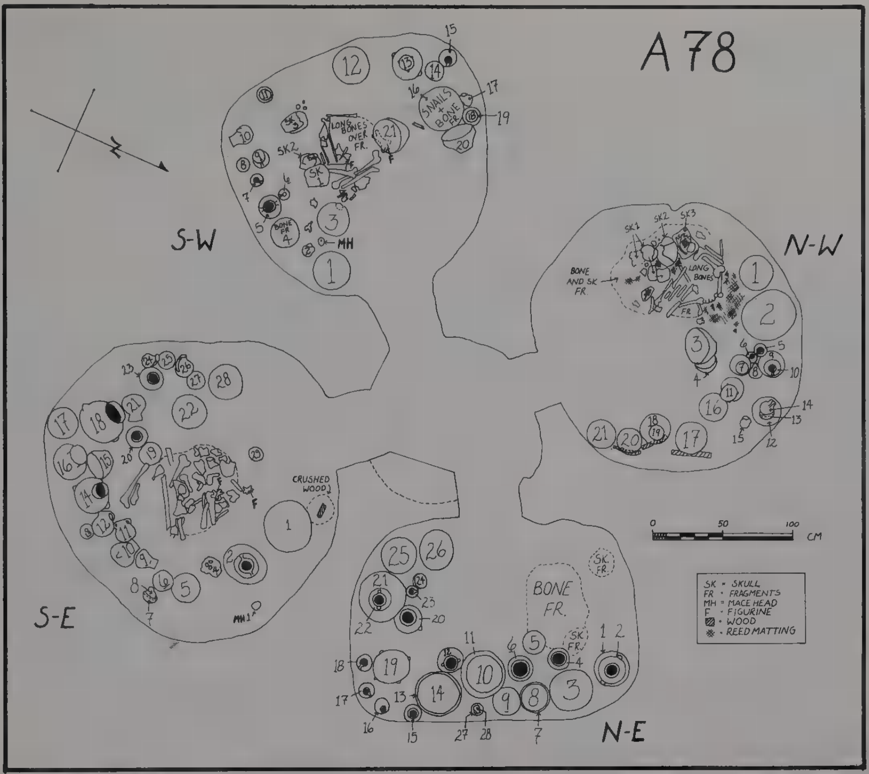
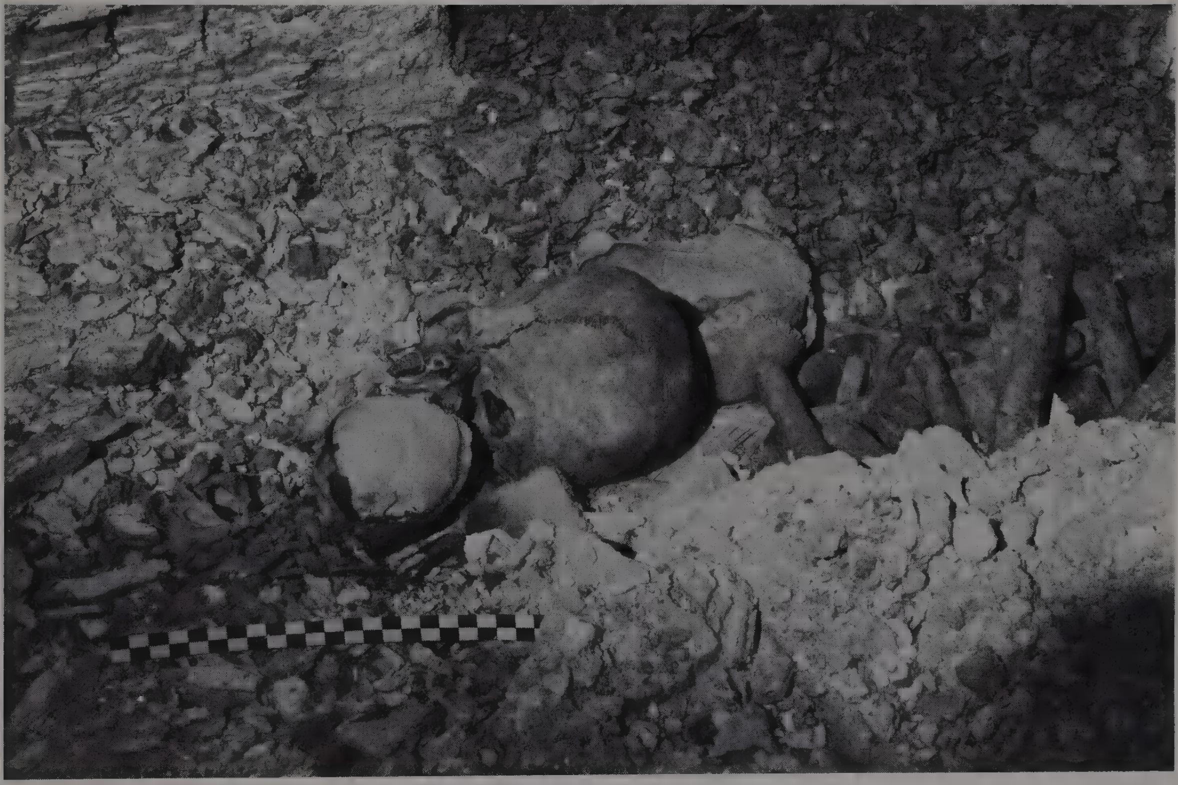


Fig. 5. Plan of shaft and four chambers of Tomb A 78.

Fig. 6. Skulls with reed matting beneath in Tomb A 78 NW, bone pile to right, extensive roof fall in chamber.



objects are placed either around the circumference or to the right of the chamber from the doorway depending on the position of the skeletal material. In addition to ceramic vessels, wood fragments were found in Tombs A 78 NW and A 78 SE, and crude, unbaked clay figurines were among the bones. A group of snail shells found with bone fragments in A 78 SW suggests that bodies may have been placed originally in shallow surface graves. Snail shells are often found with shallow graves or cairn burials in this region.

Table 1 gives the general ceramic types and other objects found in this area. The pottery from the northwest and southwest chambers of A 78 is described below. The number of pottery vessels in single chambers ranges from 6 in Tomb A 80 E to 53 in Tomb A 80 W. Large and small bowls comprise 50-60% of the total pottery with jars and juglets the remainder. In several chambers there is the same ratio of juglets and large bowls, but exceptions are too numerous to see a pattern.

Tombs A 86, A 89, A 91, A 92.

A second area where EB IA tombs were discovered was located approximately 120 m west-northwest of the previous group on the upper slope of a prominent ridge (fig. 1). The tombs here tended to display more variety. Many of the differences, however, appear to be dependent on the natural topography.

The northern end of this ridge had been explored in the 1967 excavations (Lapp 1968c: 89, pl. 4), where Tombs A 81, A 82, and A 85 were discovered. Several meters south of Tomb A 85, on approximately the same level, a recent robber's trench had uncovered the partial outline of a shaft. Clearance revealed a shallow, elliptical shaft, 1.15 m in depth, with three chambers (fig. 7). The southwest and southeast chambers both had

Table 1. Tomb Objects of Tombs A 78, A 79, A 80, A 100

Tomb and Chamber		Total Pottery	Bowls L-M	Bowls S	Jars M	Jars S	Jars St.	Juglets	Other
A 78	NW	21	11	2	2			6	Wooden staff
	NE	28	13	3	2	5		5	
	SW	21	7	4	3	1		6	Mace-head 2 figurines
	SE	29	7	6	3	9		4	Mace-head 2 figurines
A 79	N	12	6	1	2		1	3	
	S	14	5	3		1	1	5	
	W	41	17	5	6	4	1	8	
	E	27	8	8	1	1		9	
A 80	N	27	9	5	3	3		7	
	W	53	15	16	4	6		12	
	S	22	7	4		6		5	
	E	6	1	2		1		2	
A 100	E	48	15	14	2	5		12	Wood 3 figurines
	N	35	4	10	4	2	1	8	4 spouted bowls 2 ladles 1 cup
	W	23	9	4	2	1		7	
	S	8	3	1	1			3	

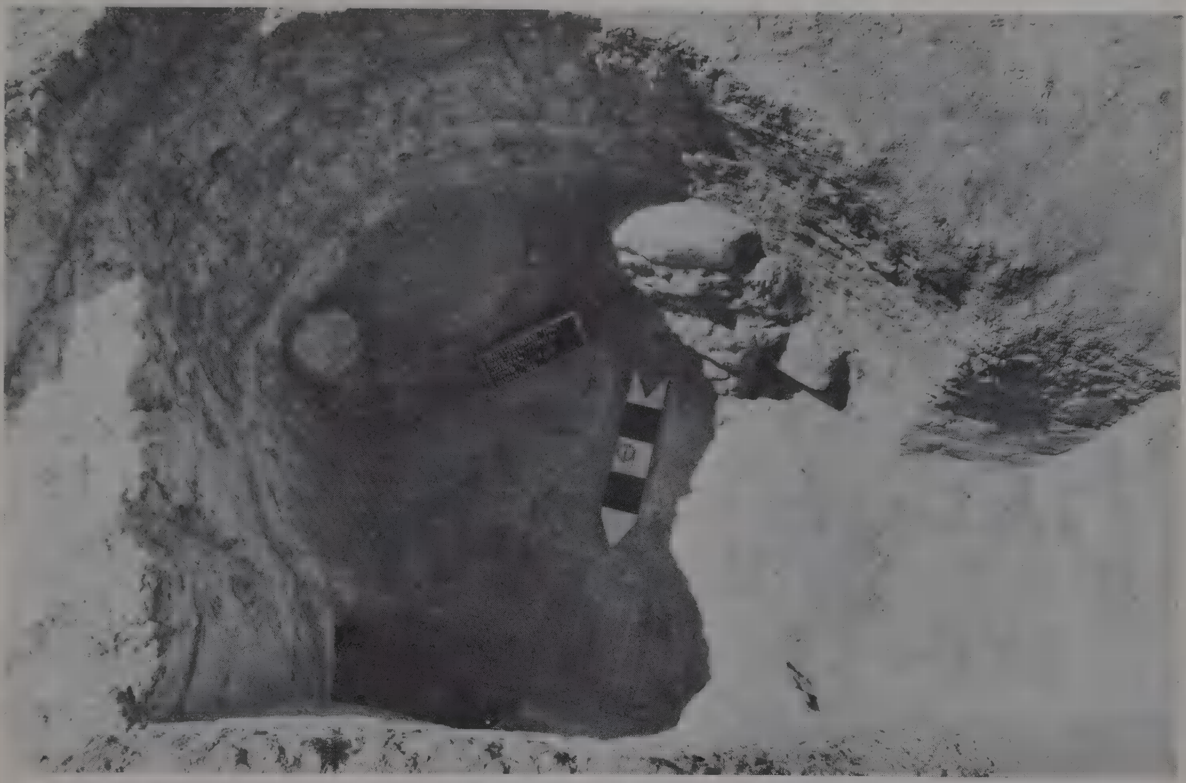


Fig. 7. Tomb A 86 with blocking stones of Tomb A 86 SE (upper left) and tomb A 86 SW (upper right) in situ, opening of Tomb A 86 NE (lower left). Square cut in lower right is trenching (unsuccessful) for fourth chamber.

blocking stones, well sealed by mortar, while the unblocked entry to the northeast chamber was completely packed with silt. The blocking stone for this chamber may have been removed in connection with the robber trench.

Removal of the southwest blocking stones revealed an empty forechamber, the first example of such architecture in the EB IA tombs at Bab edh-Dhra. The eastern wall of the forechamber was cut directly south from the doorway, paralleling the western wall of the southeast chamber which had apparently been cut first. After a meter of penetration, perhaps due to the hard marl or lack of room to expand the normal oval chamber, the tomb diggers dug first west and then northwest. A new entryway was opened, with the full-sized southwest chamber following (fig. 8). The floor of Tomb A 86 SW contained slight puddling, but the chamber and artifacts were undisturbed (fig. 9). The neighboring southeast chamber, despite the well-sealed entryway, had 0.15-0.20 m of silt. Perhaps this chamber had been left open temporarily, or the silting had occurred through the ceiling which is only 0.9 m below the surface. The entry to the northeast chamber was without a blocking stone and therefore was wholly silted. All three chambers contained human bone piles near the center of the chamber, with tomb gifts ranged along the rounded wall to the side.

A series of trenches laid out to the south of Tomb A 86 along the same ridge revealed the extensive use of this area of Cemetery A. Tomb A 89 had a circular shallow shaft, 0.61 m in depth. The ceiling of the southeast chamber, cut directly into the slope, had intersected and disrupted another chamber higher up, revealing other shaft tombs cut from the crest of the hill (fig. 10). In addition, a large hole in the northern wall of Tomb A 89 SE led to another chamber, designated as A 89 NE, at a considerably lower depth. Tomb A 89 NE was completely silted and had two levels of pottery vessels. The upper level was jumbled, and these vessels may have floated into this chamber from the southeast chamber. The second group was at floor level almost 1 m below. It seems plausible that when they encountered the chamber above and to the rear while excavating A 89 SE, the tomb diggers decided to locate A 89 NE at a lower depth. A third chamber, A 89 NW at the same level as A 89 SE, had three levels of mat

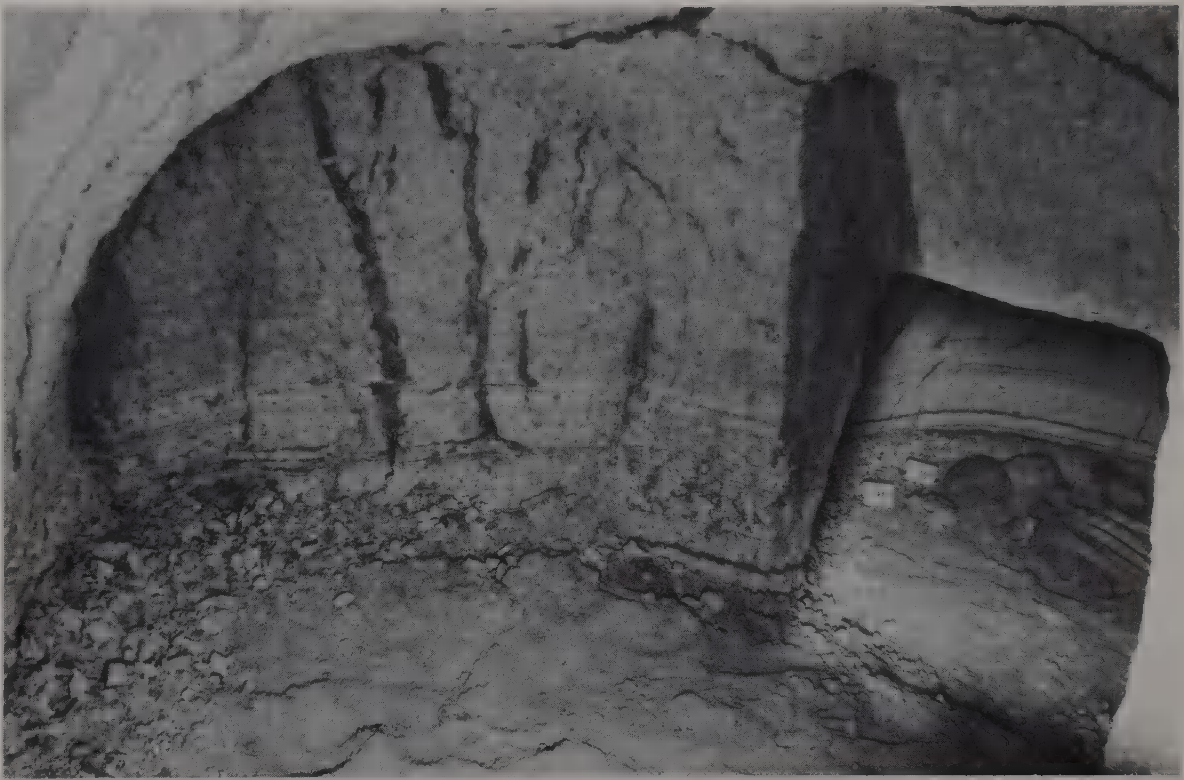
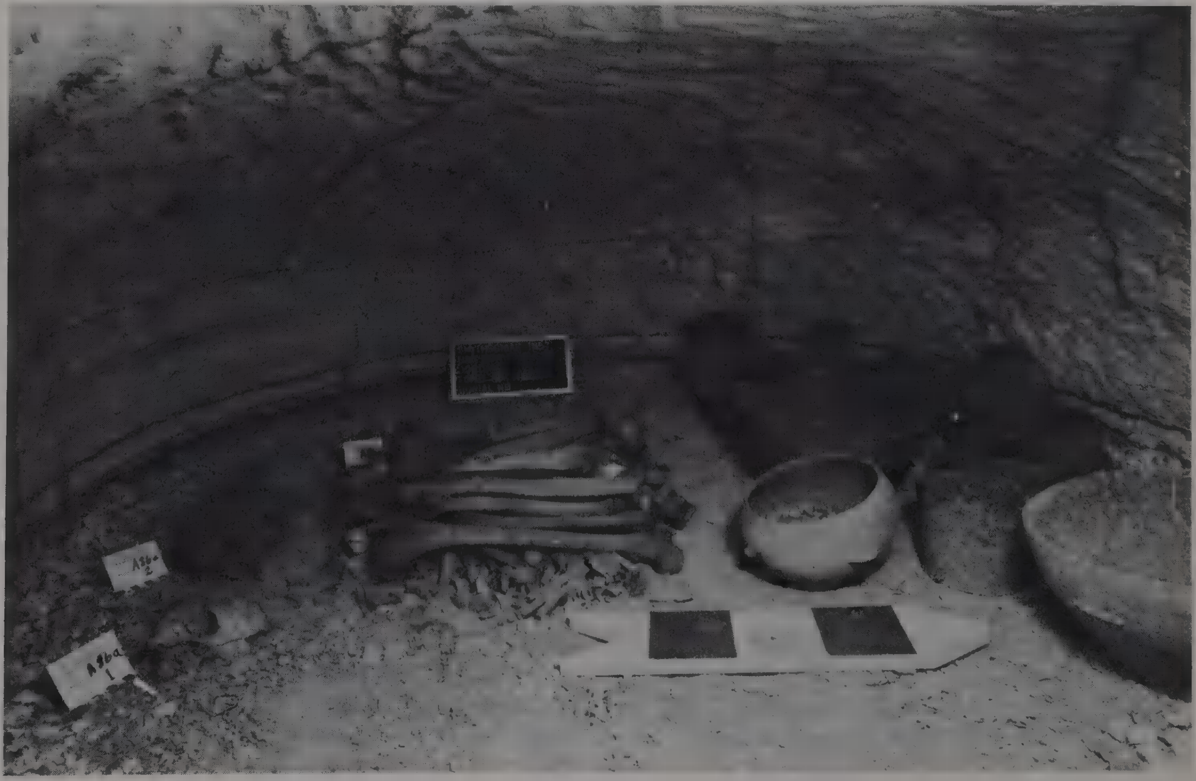


Fig. 8. Antechamber of Tomb A 86 with chamber of Tomb A 86 SW to right.

Fig. 9. Chamber of Tomb A 86 SW.



impressions with skeletal material between them. Blocking stones were only loosely in place for A 89 SE and A 89 NW, and thus both chambers were heavily silted. The skeletal material in all three was poorly preserved, but the pottery yield was rich with a total of 117 whole vessels.

About 20 m farther south another test trench exposed the 1.85 m-deep shaft of Tomb A 91, with a well-preserved chamber. Among the unusual finds in this chamber were an alabaster mace-head, two basalt bowls, and a peach pit, the latter a striking find (see pp. 119-32; 165-69). Although its presence in this well-sealed tomb suggests a primary location, the possibility of intrusion, perhaps by an animal which burrowed into the tomb, must still be kept open. Further light on the pit's date may be shed from laboratory tests made on this stone.

The western wall of the shaft of Tomb A 91 contained the outline of what appeared to be an entry to a second chamber but without a blocking stone. When this entryway was cleared, the reason for the lack of a blocking stone emerged. The attempt to cut a second chamber had been aborted when the tomb diggers had cut into the ceiling of another tomb lower and to the northwest. This tomb, Tomb A 92, had its own entryway to the west with blocking stones still in situ. Since there was more than enough work to do with the tomb already opened, the shaft was not excavated, and thus other possible chambers associated with it were not determined. This lower and somewhat earlier tomb parallels Tomb A 89 SE which, as noted previously, had cut into a chamber higher up on the hill. These results suggest that a major portion of this area, from the crest to at least midway on the slope, was used for shaft tombs.

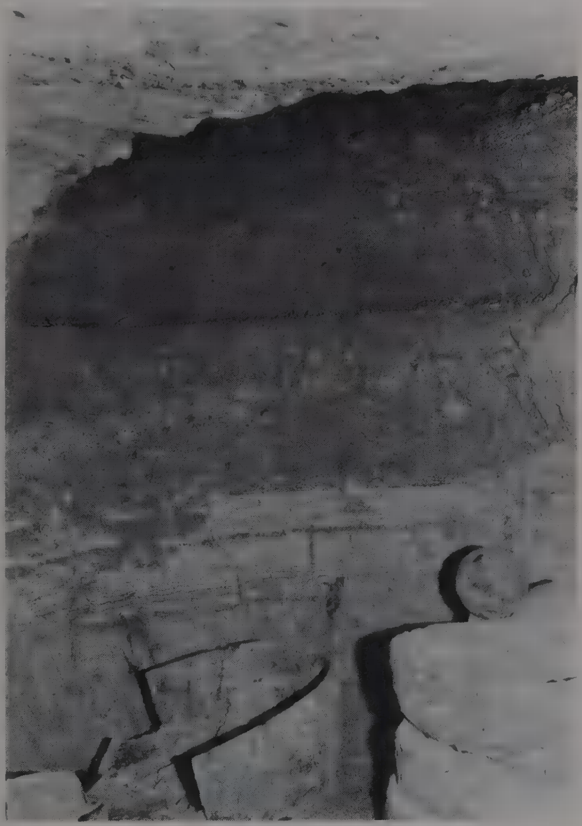


Fig. 10. Inside of Tomb A 89 SE showing exposure in ceiling of chamber of another tomb higher up on slope.

A summary of the artifacts of the tombs in this area is in Table 2. Stone jars, or ceramic vessels imitating stone jars, occurred in six of the eight chambers. Mace-heads were found in Tombs A 91 and A 92. The latter chamber also had two shell bracelets.

The EB IA Tombs of Cemetery G

The G area is located between Cemeteries C and A (fig. 1). Although it was a new area of exploration for the expedition, some illicit digging had been carried on, largely ruining the evidence of the EB IB round Charnel House G 1. Several robbed-out shaft tombs in the area also suggested that the region had been used extensively for burials during the EB IA period.

One such tomb came to light during the winter of 1977-78, following the 1977 season. At the end of the 1977 season a trench had been cut through the dirt floor of Charnel House G 1 to check stratification. During the following winter a heavy rain eroded the trench, exposing an opening through which a tomb was noticed by the expedition's guard. The local Department of Antiquities representative was alerted, and David McCreery, the Albright fellow of the American Schools of Oriental Research and a staff member of the expedition, supervised clearance of two EB IA chambers of a shaft tomb, G 6.

The east chamber of Tomb G 6 was located under the center of the floor of Charnel House G 1 (fig. 11). A hole in the west wall of this chamber led to a second chamber which was directly under the threshold entrance of G 1. Blocking stones in situ, belonging to the entrances at the bottom of the shaft, were found within the line of the northern wall of G 1. The relation of Tomb G 6 to G 1 is

Table 2. Tomb Objects from Tombs A 86, A 89, A 91, A 92

Tomb and Chamber		Total Pottery	Bowls		Jars			Juglets	Other
			L-M	S	M	S	St.		
A 86	SW	16	3	1	2	4	1	6	
	SE	7	2			2	1 (imt.)	2	
	NE	20	6	2	2	3	1 (imt.)	6	
A 89	NW	39	10	5	5	11		8	Mace-head Beads
	NE	32	10	3	3	4	1	12	
	SE	46	20	10	2	5		9	
A 91		30	8	6	2	4	2	10	Mace-head Peach pit
A 92		19	6	6		2	1	5	Mace-head 2 shell bracelets

significant, offering further evidence for a sequential relation of EB IA to EB IB tombs.

Another significant discovery in this tomb was the association of pottery types. The forms and ware were typical EB IA. Seven vessels and one basalt jar were found in G 6 E while eight ceramic vessels were in G 6 W. P 4, (P here and elsewhere = pottery vessel), in the latter chamber is a shallow, carinated bowl belonging to types known only in Cemetery C tombs (fig. 12). This is the first example of a vessel of this type appearing in the same tomb with pottery of Cemetery A types.

Tomb G 4, located on a ridge approximately 10 m to the south, showed differences from the usual shaft-tomb pattern. A shaft with blocking stones and chamber was present, but the vertical walls of both shaft and chamber, extending almost to the surface, were lined with cobble-sized stones (figs. 13 and 14). The unusual architecture may have been dictated by the gravel layers into which the tomb was cut. Several wood impressions were found against the wall of the chamber, and these, along with wood fragments on top of the bone pile, indicated that the tomb makers had used a number of wood beams.

Another unusual feature of Tomb G 4 was the opening in the west wall of the stone-lined shaft, directly opposite the blocking stones and entryway

Fig. 11. Charnel House G 1 with trench in center and opening into G 6 E.

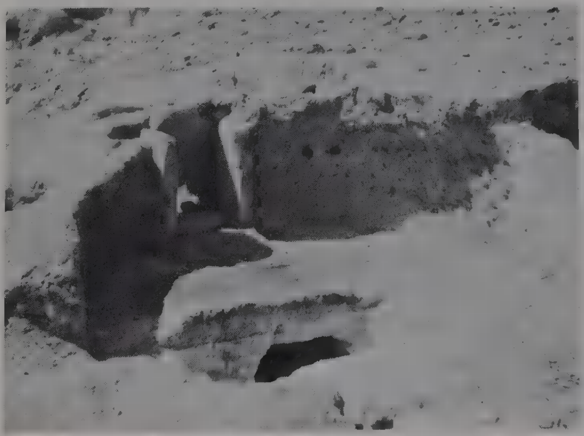
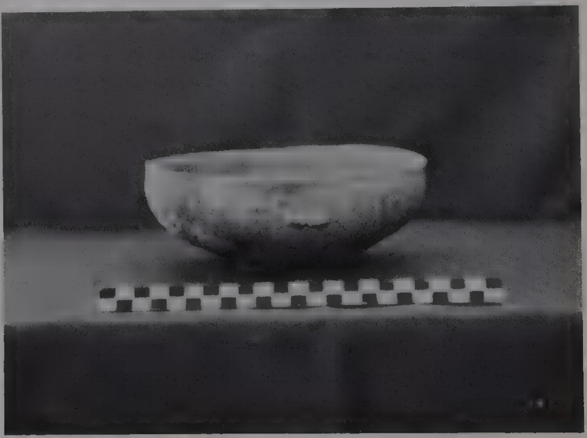


Fig. 12. Cemetery C type ware pot, P 4, of Tomb G 6 W.



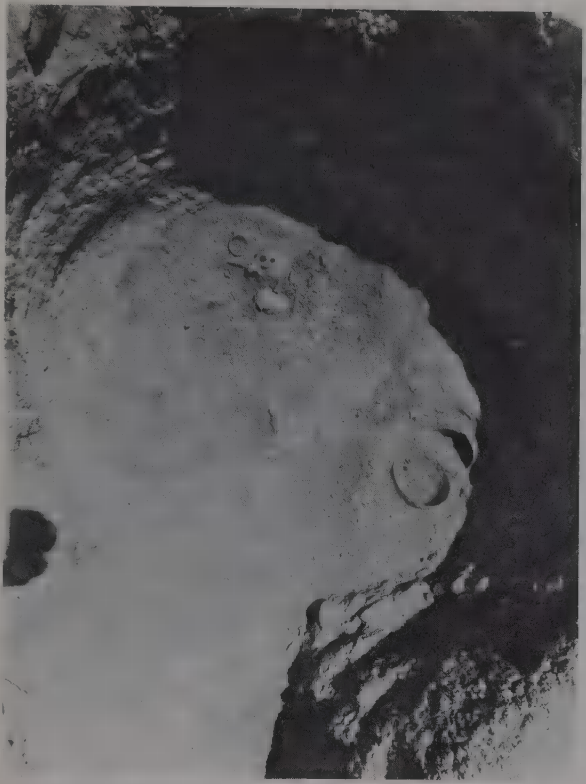


Fig. 13. Tomb G 4, looking east, shaft bottom left.

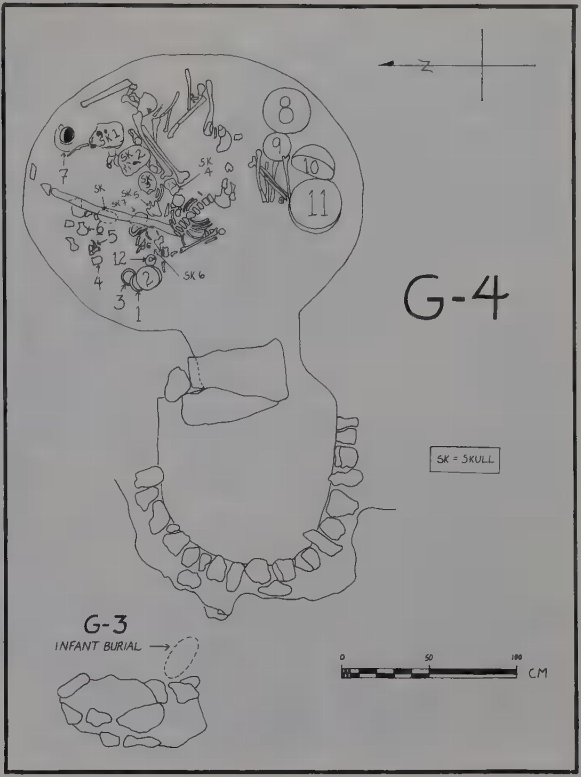


Fig. 14. Plan of Tombs G 4 and G 3, stone lining of chamber not shown.

of the east wall. The opening resembled an entryway in shape and position. Originally it had been closed off by a series of wooden posts, the remains of which had left an impression in the soil layers (fig. 15). The posts may have supported the stone lining of the shaft, but the purpose for the opening itself was not clear. It is possible that a second chamber may be present to the west, underneath the shallow burial of an infant (G 3) discovered under a number of boulders (fig. 14).

Several features of Tomb G 4 support the possibility that this tomb is an intermediate type between the undergound shaft tombs and the partially above-ground, round charnel houses. This is especially evident in the architecture of the chamber and shaft, the extensive use of wood, and particularly the large number of burials (nine), a few of which had evidence of articulation, probably not primary. The pottery, however, is EB IA without any of the more obvious transitional types closer to EB IB. It seems likely that the tomb was a special adaptation to the gravel of the area. But it may also be argued that as the natural marl areas became exhausted, the transition to the charnel house building became a necessity.

The EB IA Tombs of Cemetery C

The last EB IA area investigated during the 1977 season was at the far west end of the cemetery region just above the last descent into the Ghor (fig. 1). In 1965 Lapp examined the lower slopes of this ridge above the modern road (Schaub 1973: 30-32). Here were excavated six shaft tombs angled into the slope of the hill with wide openings blocked off by stone walls. The pottery of these shaft tombs, in basic typology of wide bowls, wide-mouth jars and juglets, is similar to the Cemetery A ceramics, but the ware and form profiles, especially the carination of the bowls, set it apart as Cemetery C ware (Schaub 1973: 107-8).

During the 1977 season a number of trenches were opened up on the crest of the hill above Lapp's excavations. Although work in this area was limited, the results were productive in exposing three chambers. Two of these were connected to the same shaft, all containing the same Cemetery C ware which Lapp found on the lower slopes.

Tomb C 10.

This tomb was excavated 6 m to the west. Here

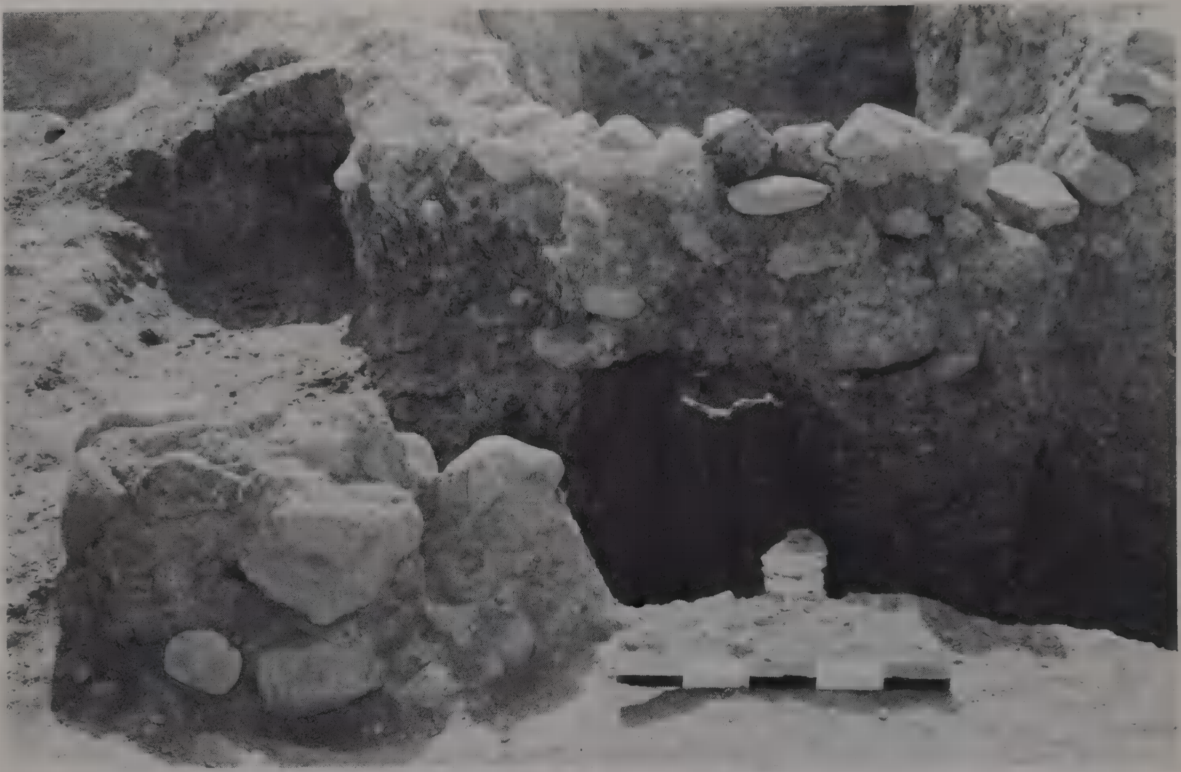


Fig. 15. Tomb G 3 (infant burial) below stones at lower left, exterior of shaft of Tomb G 4 in center with opening and wood post impressions.

the efforts at defining the tomb architecture were also frustrated by the natural gravel stratigraphy into which the tomb was cut. Enough was defined, however, to show that Tomb C 10 was similar to the typical Cemetery A EB IA shaft tombs. A fairly deep shaft, rectangular in plan, led to two chambers, both with entryways and blocking stones. In C 10 W the stones were loosely in place, and in C 10 E they had collapsed back into the shaft. The drop from the shaft floor to the chamber floors (0.50-0.60 m) may have been caused by the tomb diggers searching for a marl matrix. Both chambers were completely filled with roof-fall and collapse of the grave chamber walls. The collapsed walls in C 10 E also revealed another chamber to the south which was not excavated due to the pressure of time. Among the unusual finds in C 10 W was a series of bone needles in P 1 of C 10 W.

Summary of the EB IA Tombs

A total of 14 shafts and 35 chambers from the various areas of the cemetery excavated in 1977 date to the EB IA period. In Cemetery A the most consistent features, in addition to the pottery, were several chambers cut from the same shaft along with the disarticulated burials. Only tomb A 91 had a single chamber, and even in this case a second chamber had been attempted. Cemeteries C and G both had examples of single chambers, but the shaft of Tomb C 9 was not found and in the case of Tomb G 4, unusual in other ways, including evidence of articulated burial, the possibility remains of another chamber to the west of the shaft.

The consistent pattern of secondary, disarticulated burials together with the lack of evidence for permanent settlement during the EB IA period elsewhere on the site has led to the hypothesis that the burials are the result of periodic returns to the site by the EB IA peoples (see pp. 7-34). Further arguments may be drawn from the numerous examples of chambers which had cut into chambers of other tombs. These data suggest both a lack of overall planning and some uncertainty concerning the location of earlier tombs. They seem to support the notion of periodic return.

The pattern of several chambers off one shaft, along with the evidence that some shafts were left open for a period of time, argues for the possibility that some clans or families used the same areas consistently over a period of time. This interpretation is supported by the typology of the ceramic vessels, which seems to point to a conservative, ongoing tradition of related groups with similar needs and life styles. The basic type of shaft tomb with some variation remains the same in all areas of the cemetery during this period, including Cemetery C.

The extensive use of the cemetery for EB IA tombs, indicated again by the frequency with which tombs cut into one another and the number of tombs cut into gravel, may have been one of the factors influencing the eventual transition to partially above-ground houses during the EB IB period.

The EB IB Tombs

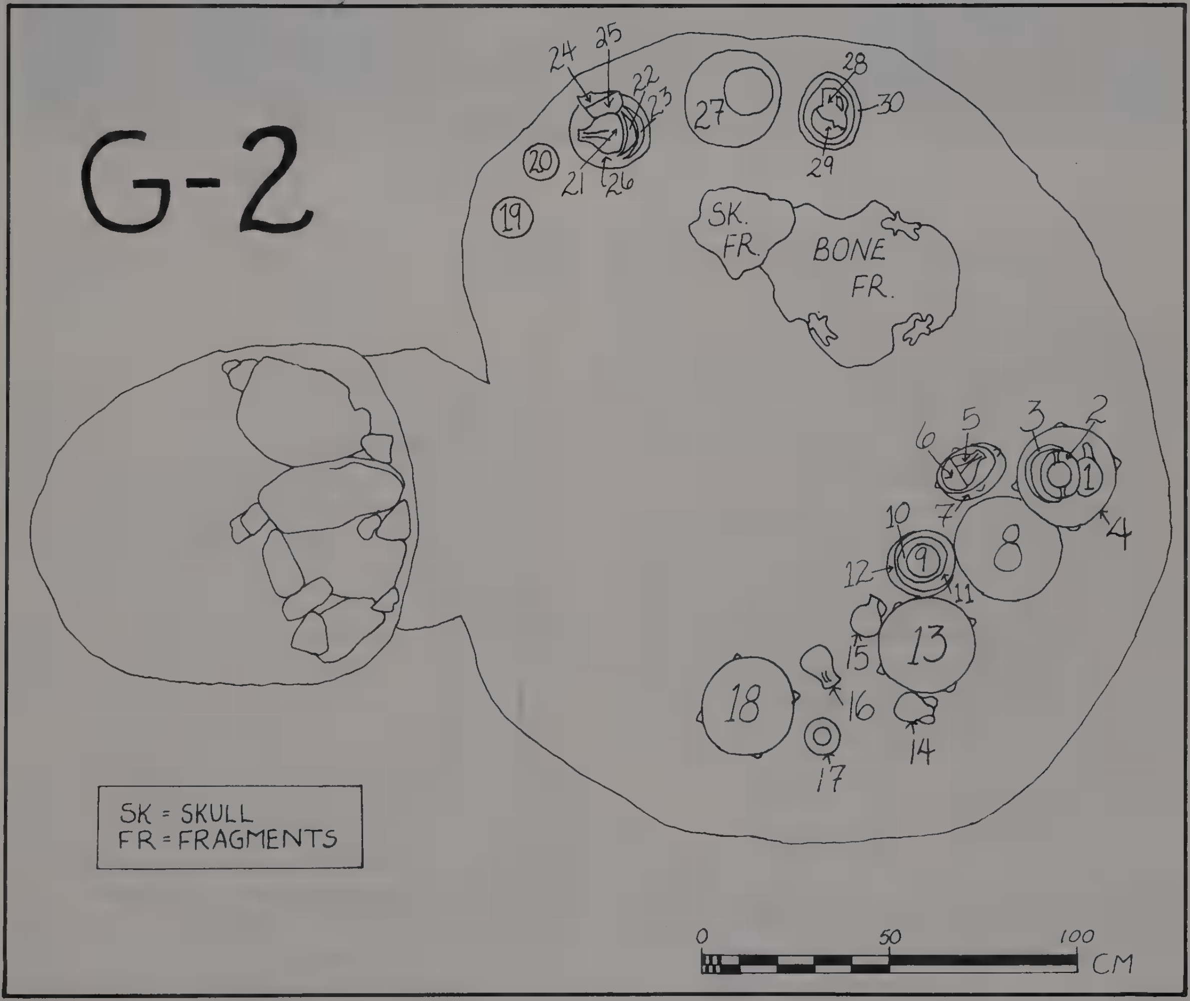
The four EB IB tombs excavated in 1977, each in its own way, highlight different aspects of the transitional nature of this period.

Tomb G 2.

This tomb, located 7 m west of Tomb G 4 and south of Tomb G 1 (fig. 1), maintains the traditions of EB IA but also offers evidence for the beginning of the EB IB tradition.

A fairly shallow shaft, 1.30 m deep and oval in shape, led to a single entryway which was blocked with four medium-sized boulders. The chamber

Fig. 16. Plan of shaft with blocking stones and chamber of Tomb G 2.



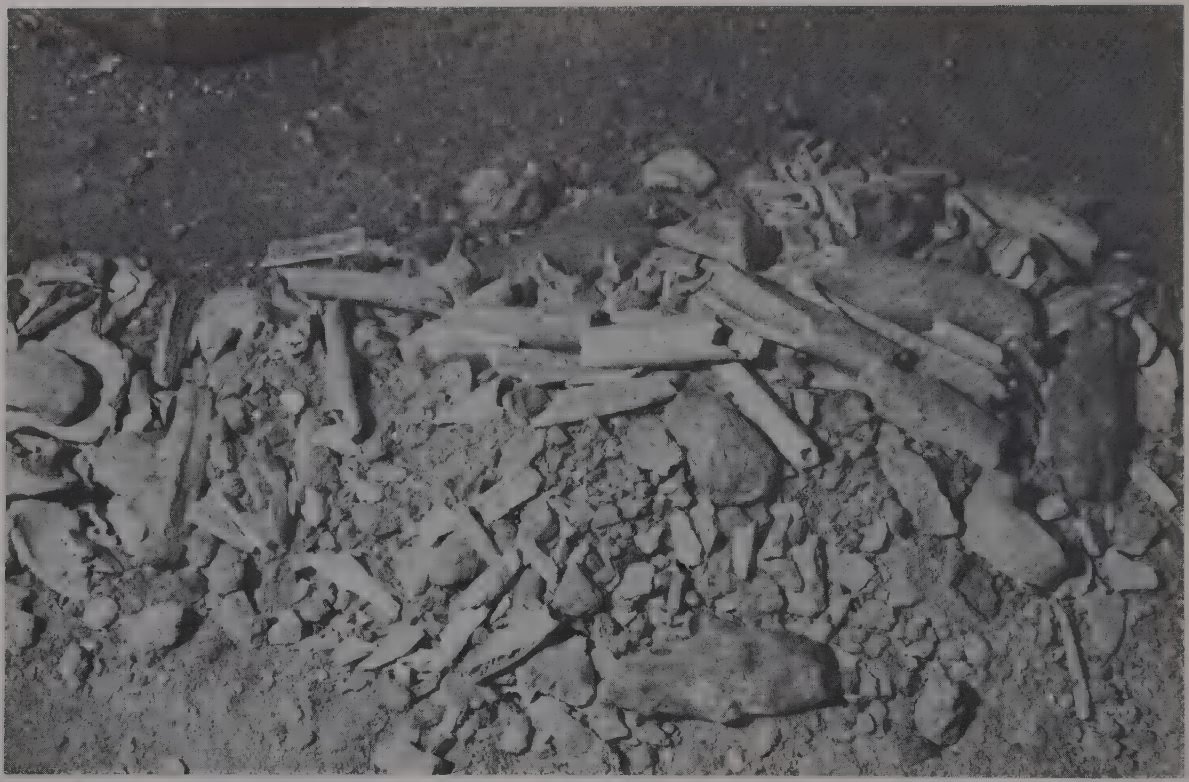


Fig. 17. Position of figurines on bone pile of Tomb G 2.

itself was dug into gravel layers while maintaining an oval shape similar to the typical chambers cut in the Lisan marl. The gravel layers had subsequently collapsed, burying the artifacts and skeletal material under 0.60 m of loose stones. The chamber was without evidence of silting. Two individuals, one adult and one subadult, were represented in the disarticulated bone pile (fig. 16). Three unbaked clay figurines were discovered in the bone pile (fig. 17).

Thirty pottery vessels in the chamber were predominantly EB IA in type, but several transitional types, isolated in previous studies (Schaub 1973: 216-33) were present. The most distinctive form was a spouted bowl. None of these vessels had line-group painting, but, at the same time, only two had the traditional punctured decoration typical of the EB IA tombs.

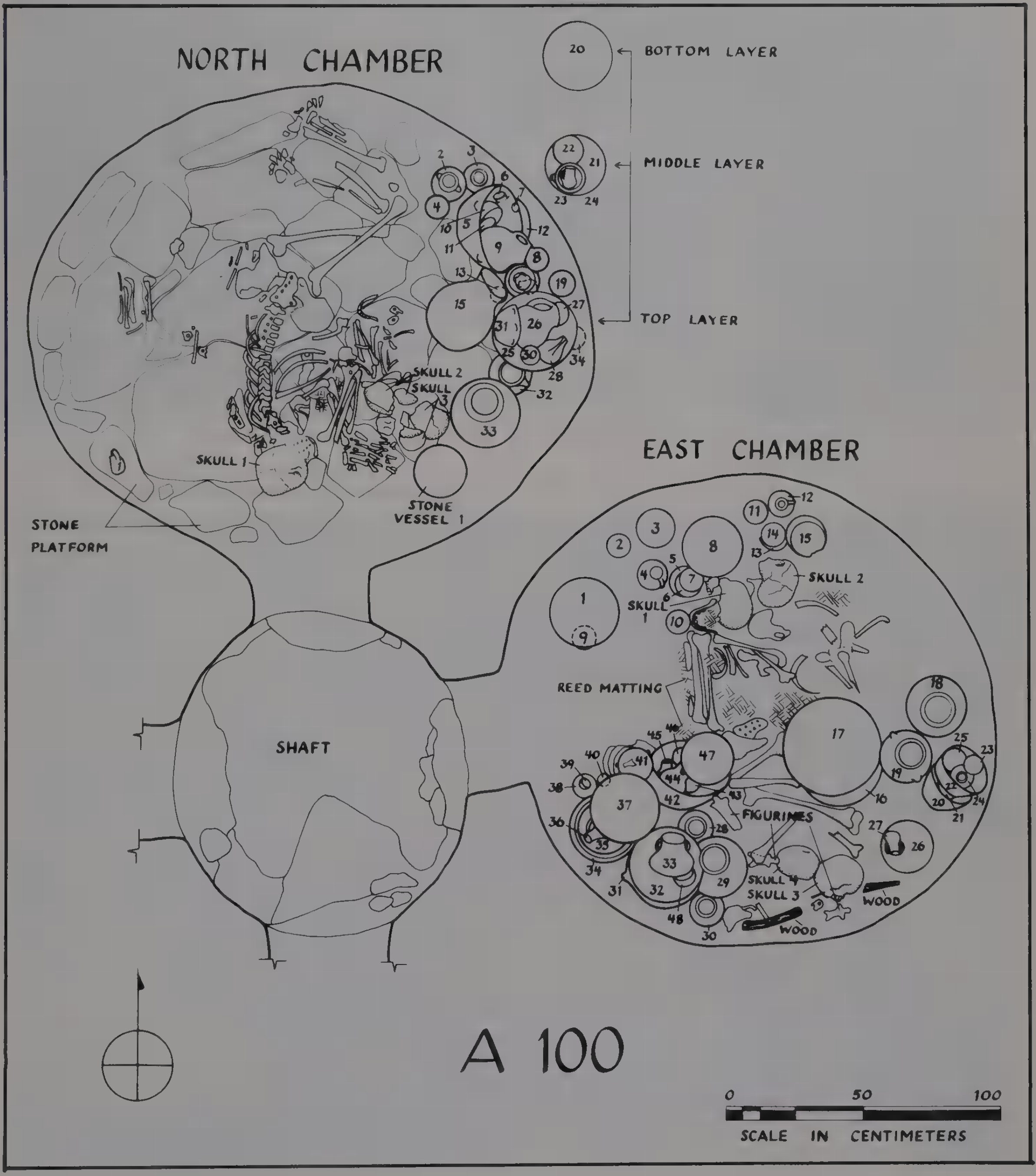
The shaft, the disarticulated burials, and many of the vessels thus maintain the traditions of the EB IA tombs. The single chamber typical of other EB IB tombs previously discovered, together with transitional pottery types, situate this tomb in the earliest stages of EB IB. The figurines, previously found only in EB IA contexts, suggest related population groups rather than a new people or culture.

Tomb A 100 N.

The north chamber of Tomb A 100 was an unusual discovery among the EB IA tombs. In addition to line-group painted vessels among the ceramic offerings, an articulated adult skeleton was found on a well-preserved reed matting along with the scattered, partially articulated remains of two subadults (fig. 18). Most of the surface of the chamber was covered with a carefully laid, flat, stone floor, and the latter was partially outlined with upright stones near the curved walls of the chamber (fig. 19). The flooring is the first of its kind found at Bab edh-Dhra, but it has a close parallel at Jericho in the upper levels of Tomb A 13, which also had line-group painted pottery (Kenyon 1960: 48-51). The flat stones used in the floor also appear related to similar stones used to frame the entryways of other EB IB tombs at Bab edh-Dhra. Thus, most of the features of this chamber are characteristic of previously discovered EB IB tombs, particularly the articulated skeletons and the pottery forms. The latter place the group early in the EB IB tradition.

It is noteworthy that all other tombs in this tradition have been single chamber tombs or round charnel houses. Not only is Tomb A 100 N the first chamber containing line-group pottery which is connected with a multi-chambered shaft, but also the three other chambers of this tomb have exclusively EB IA ceramic forms and disarticulated burials. On the one hand, this variation in pattern seems to stress the transitional nature of EB IB. At the same time it appears to demand a degree of overlap that weakens the concept of transition.

Fig. 18. Plan of Tomb A 100, shaft and two chambers, Tomb A 100 N and E.



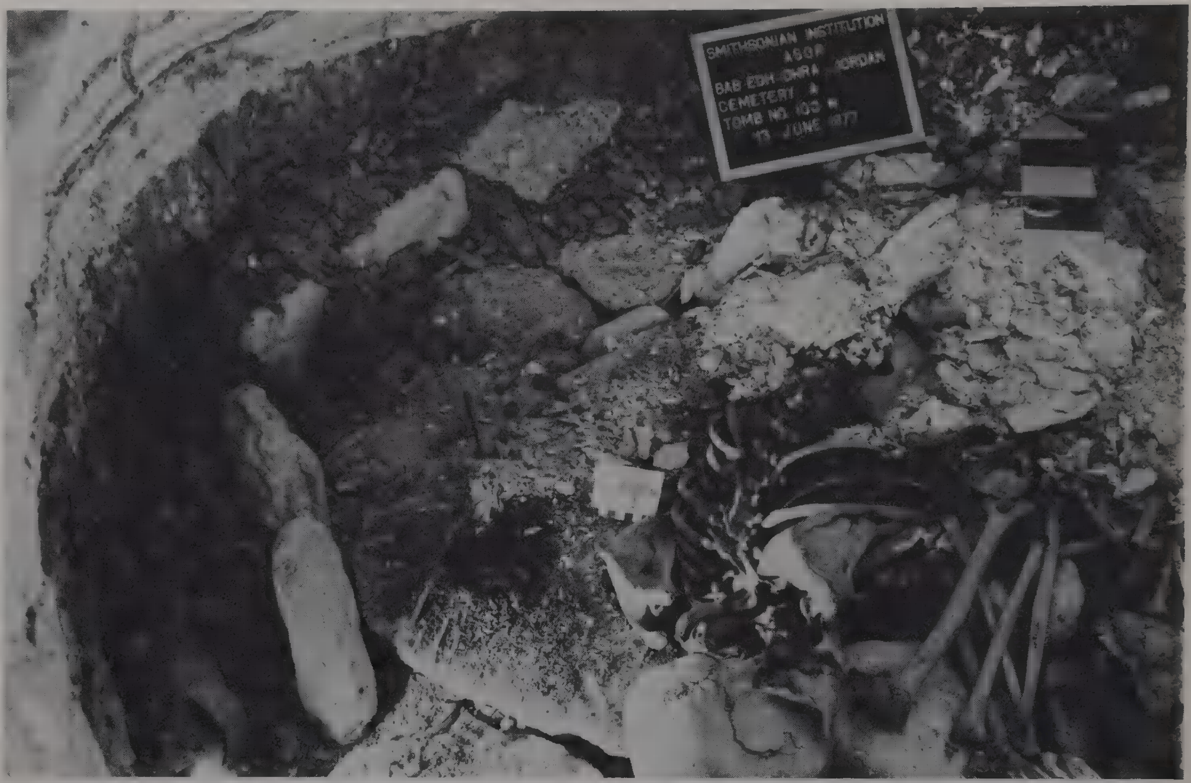


Fig. 19. Tomb A 100 N with articulated adult skeleton in lower right, platform and upright stones in center and around circumference of chamber, before cleaning of roof fall.

The variation does not seem to be crucial. There are also late EB IA tombs with articulated burials (Tomb G 4). This feature seems to be related more to a permanent population at the site than to a cultural difference. The relationship to other EB IA chambers off the same shaft also may be explained by another unusual variation in burial pattern which occurs in the east chamber of Tomb A 100.

The most consistent feature in the placing of skeletal material in the EB IA chambers, not only in this area but throughout the cemetery in all of the tombs excavated to date, has been the positioning of the skulls to the left of the disarticulated bone pile. The only exceptions to this pattern have been associated with tombs having line-group painted or later pottery. The north chamber of Tomb A 100 is among the exceptions, and it, too contained line-group painted pottery, one articulated skeleton just inside the doorway, and two other subadults to the right of the doorway. It is noteworthy that a bone fragment was found in the chamber which does not belong to any of the articulated skeletons.

The east chamber of Tomb A 100, however, is the first example of an EB IA chamber with two distinct bone piles and two groups of skulls: one group, on the left, following the normal pattern and the second, on the right, between the second bone pile and the wall (fig. 19). A solution which suggests itself is that the second bone pile with skulls on the right was moved into this chamber from its original resting place in the north chamber by the EB IB users of Tomb A 100 N. The unusual preparation of the stone-paved floor, the line-group pottery, and the articulated burial all support the conclusion that Tomb A 100 N is the latest burial of this shaft. In fact, it may have been made even after all of the other chambers had been used for burials. If this interpretation is correct, it would suggest that the shaft either had been left open or was reexcavated. Evidence supporting the possibility of an open shaft comes from Tomb A 79. Here a small wide-mouth jar with ear handles, a transition type to EB IB, was found intact in the shaft, level with the top of the entryways. Since the pottery of the A 79 chambers is typically EB IA, the shaft would appear to have been partially filled until the beginning of the EB IB period. A parallel circumstance of an EB IB pot in the shaft of an EB IA tomb was recorded during Lapp's excavations. In either case, reexcavated fully or partially, the earlier burials and offerings of Tomb A 100 N may have been moved to A 100 E, causing the duplicate arrangement in the latter chamber. Tomb A 100 N was then prepared with a stone floor and the articulated burial placed in the chamber.

Confirmation of this interpretation by attempting to match the innominate found below the pavement of the north chamber to the skeletal material of the east chamber has not been forthcoming, but the unexplained bone certainly argues for a previous burial in Tomb A 100 N which was cleaned out before the present burial (see pp. 119-32).

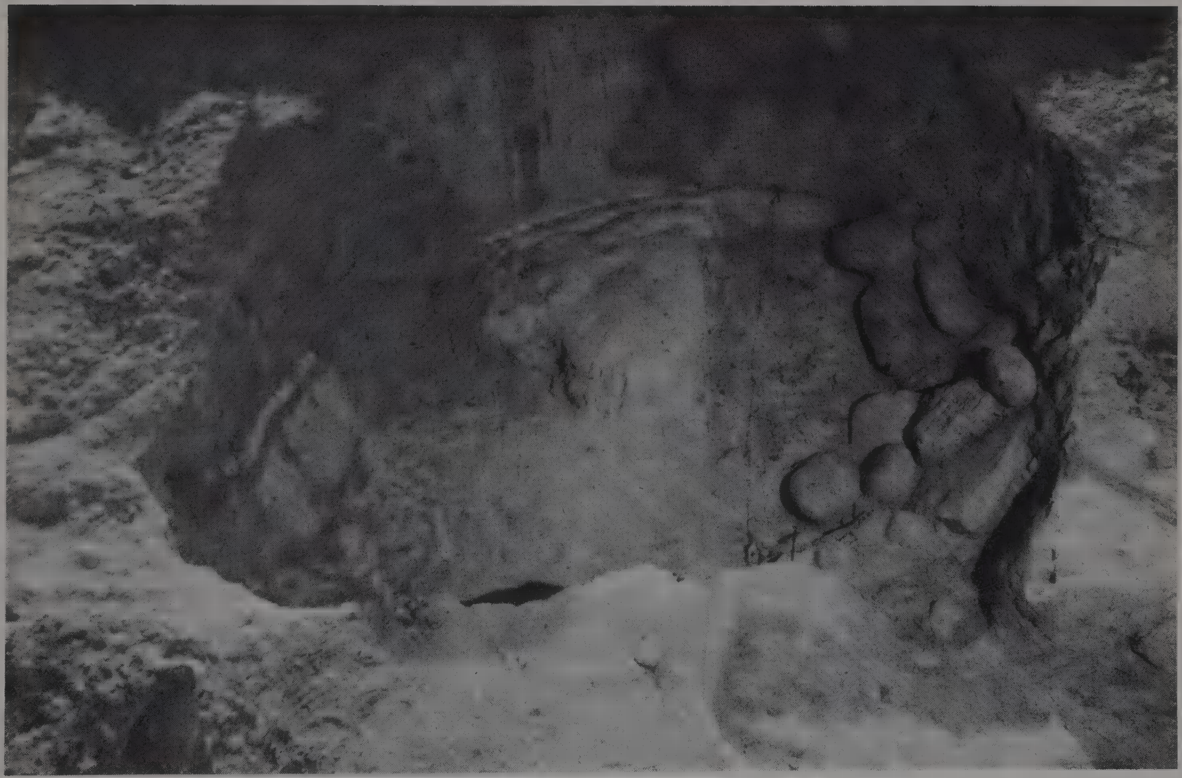
Tomb A 88.

This tomb consisted of a single chamber with 95 vessels, many belonging to the line-group painted tradition of EB IB. The size of the pottery group, its variety and integrity, are an important contribution to the development of pottery styles and types at Bab edh-Dhra and in Palestine from EB I to EB II.

The chamber was discovered between Tombs A 91 and A 89, closer to the latter and on the same contour level (fig. 1). The exploratory trench in the area had uncovered a confusing stratigraphic picture with a number of disturbances, which did not appear to be recent and which obliterated the regular soil outlines (fig. 20). In an area which could have been the shaft, but which might also have been an antechamber, three large boulders, one 0.75 m long, were found together. These may have been blocking stones, but they were particularly noteworthy because a similar phenomenon of boulders was associated with EB IB Tomb A 43, excavated by Lapp in 1965. Exploration to the northwest of this area revealed another possible shaft outline.

Approximately 1.5 m south of the boulders underneath, and behind another line of smaller boulders (fig. 20), an articulated female skeleton, A 88 Upper, was uncovered (fig. 21). Only one small, simple vessel, insuffucient for dating purposes, was associated with this burial. Further clearance of the area, at a level 0.3 m below the articulated skeleton, exposed the pottery, bone groups and chamber of A 88 Lower (fig. 22). The

Fig. 20. Area of Tomb A 88 showing several disturbances in stratigraphy and boulders covering articulated skeletons of Tomb A 88 U. Possible shaft outline of latter in lower right.



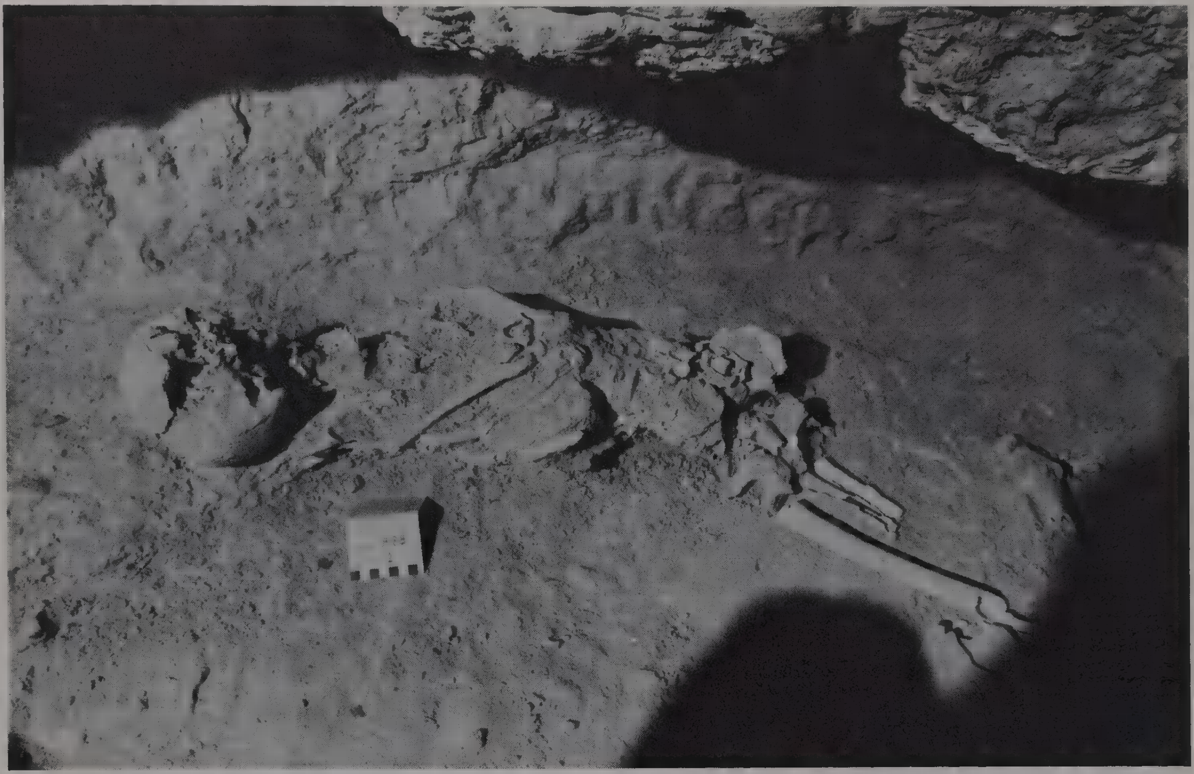


Fig. 21. Articulated skeleton of Tomb A 88 U.

bone groups and skulls were scattered around the chamber, contrary to the normal EB IA pattern. Although there may have been primary articulation in the original placement it was no longer evident.

Several features of Tomb A 88 Lower are comparable to the observed patterns of other EB IB tombs, particulary Tomb A 43, excavated previously at Bab edh-Dhra (Lapp 1966: 110; 1968b: 8; Schaub 1973: 41-44): (1) it was a single chamber tomb, (2) the bone piles and skulls did not follow the observed pattern of the shaft tombs, (3) it contained a large quantity of pottery, and (4) it appears to have cut into or interrupted other tombs.

Although the burials in Tomb A 88 Lower appear to have been disarticulated due to later disturbances, the tomb pottery represents a later stage of development than that of Tomb A 100 N. The same may be said of Tomb A 43 excavated by Lapp, with the further qualification that the pottery of A 43 is even later, containing types which became common in EB II, particularly narrow-necked amphoriskoi and a net-painted jar. Both the pottery and the variant burial practices, especially in relation to what follows in EB II, underscore the transitional nature of this period. It is possible that during this period, while a permanent population was beginning to establish itself on the town site, related groups were still maintaining seasonal visits to the site bringing their dead for burial.

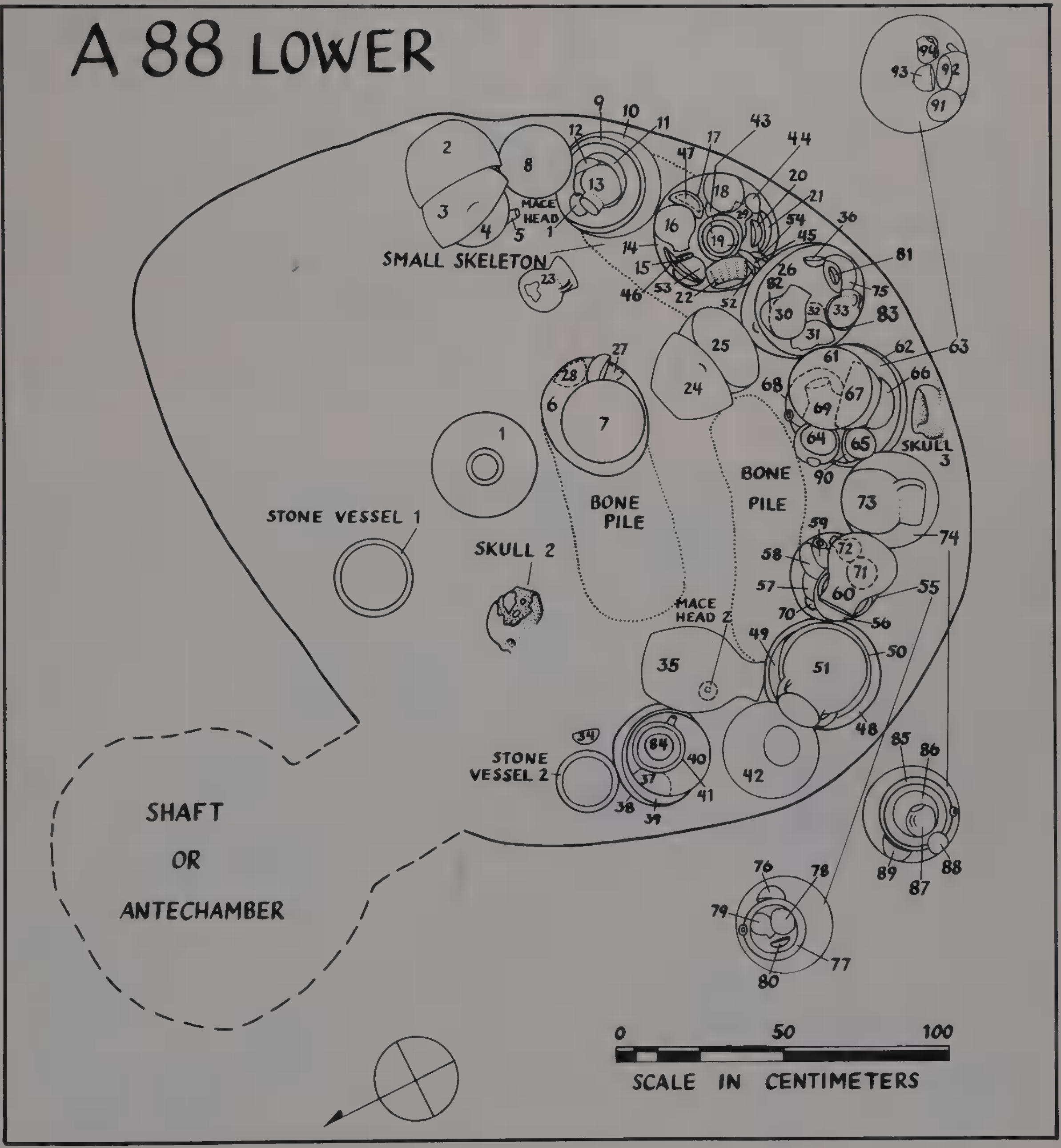
Tomb G 1.

The round mudbrick Charnel House G 1, below which the previously noted EB IA Tomb G 6 was discovered, exemplifies the full transitional nature of the EB IB period. The southern half of this house had been severely disturbed and cut into by modern trenching. With careful clearance the preserved northern half, with several undisturbed layers and intact entryway, emerged (fig. 23). A foundation cut for the house had been made into the northern slope of Lisan marl and the area leveled before the construction of the building. Sand and gravel had been placed as a footing for the wall. The building had an inside diameter of 3.70 m. The bonded mudbrick walls were 0.37 m wide in the best-preserved sections and tended to curve inward in beehive fashion. On the northern circumference the wall was preserved 1.30 m in height.

In front of the entryway was a semicircular forecourt of mudbrick construction, possibly a carry-over from the shafts of earlier tombs. Two large orthostats, 0.85 × 1.50 m, flanked the entryway. A large threshold stone was also placed in the entry. Fragments of a possible lintel stone were found in the debris. A large blocking stone, found in situ, probably rested on the floor of the entryway. Its elevated position suggests that there was a step down onto the threshold (fig. 24).

The skeletal material was widely scattered, but there was evidence of primary articulation. Several ash lenses and the fire-blackened floor reveal that there had been extensive burning within the house. Remains of charred cloth and traces of matting

Fig. 22. Plan of Tomb A 88 Lower.



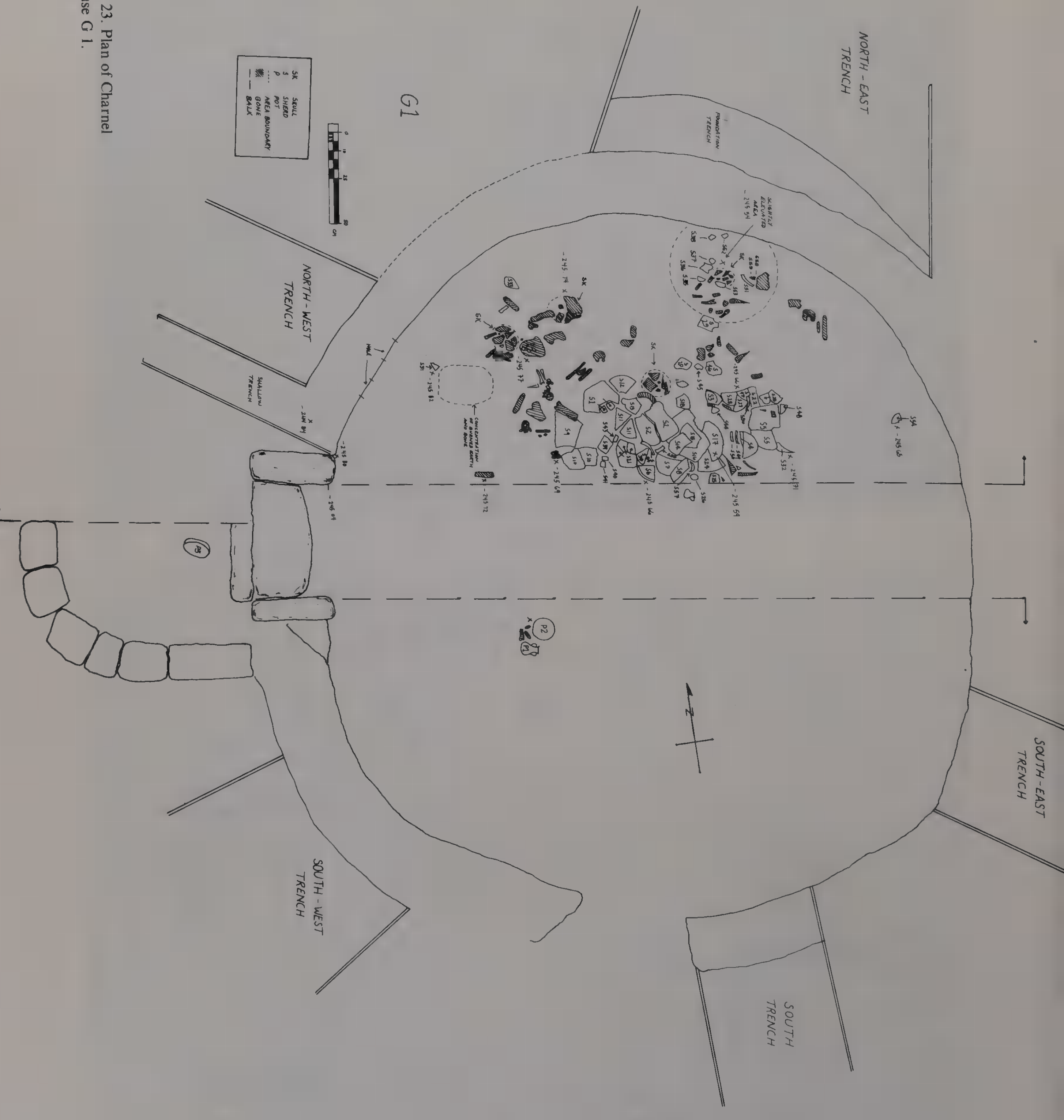


Fig. 23. Plan of Charnel House G 1.

were also found within the undisturbed layers. Only 11 complete ceramic forms were retrieved, but the restoration of the sherds should expand the collection considerably. The forms of the pottery are EB IB, including line-group painted vessels and narrow-necked amphoriskoi.

Tomb G 1 is a close parallel to the round mudbrick Charnel House A 53, excavated in 1967 (Lapp 1968b: 8; 1968c: pl. 5; Schaub 1973: 44-46). The latter was better preserved with evidence of a second story or wood-beam roof. Both date to EB IB and represent a possible development from the underground circular shaft tombs and chambers to the predominant rectangular charnel houses of EB II-III. Several architectural features may be seen as carry-overs from the EB IA shaft tombs: circular plan, possibly dome-shaped with flattened roofs, and the forecourt resembling a shaft. In several of the latest EB IA shaft tombs and some EB IB shaft tombs the entryway was framed by standing stones along with a lintel stone. The downstep in the forecourt, with walls perpendicular to the house and not closed off, is maintained in the later EB II-III charnel houses when the plan of the building becomes rectangular.

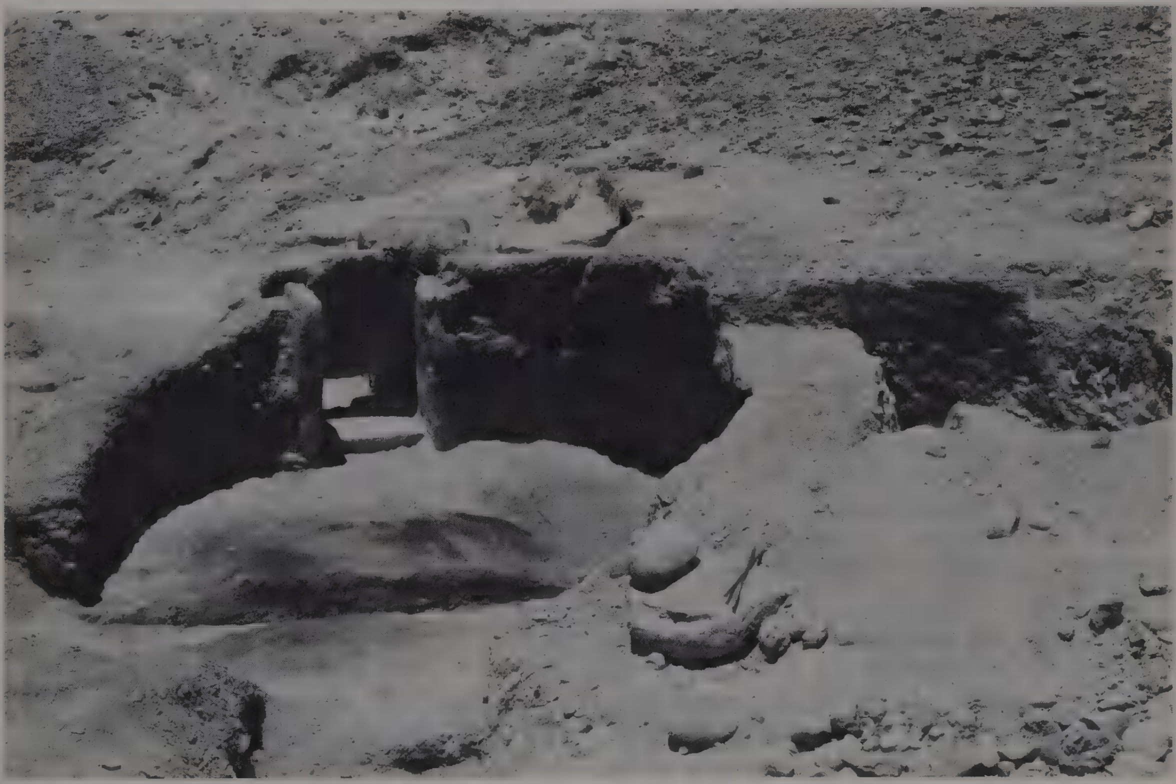
The functional features of these charnel houses, with their easier accessibility for immediate burials and larger areas, were well adapted for a more permanent population at the site.

An EB II Charnel House

Further confirmation of the transitional character of EB IB came from the discovery of the first round mudbrick charnel house dated to early EB II. Tomb A 56 was located at the northern edge of Cemetery A on the lower slope of a hill and slightly above the major east-west wadi of the cemetery area (fig. 1).

This tomb was small in contrast to Tomb G 1, averaging about 2.30 m in diameter, but it was found intact with its wall preserved at some points to a height of 1.70 m (fig. 25). The circular wall was constructed of mudbrick in staggered stretcher and header courses, corbelled inwards slightly on successively higher courses. The diameter of the preserved height of the building was 1.70 m, in contrast to the base diameter of 2.65 m. The entry-

Fig. 24. Charnel House G 1, looking west with orthostats and blocking stone in left center and trench cut through floor of house in lower left.



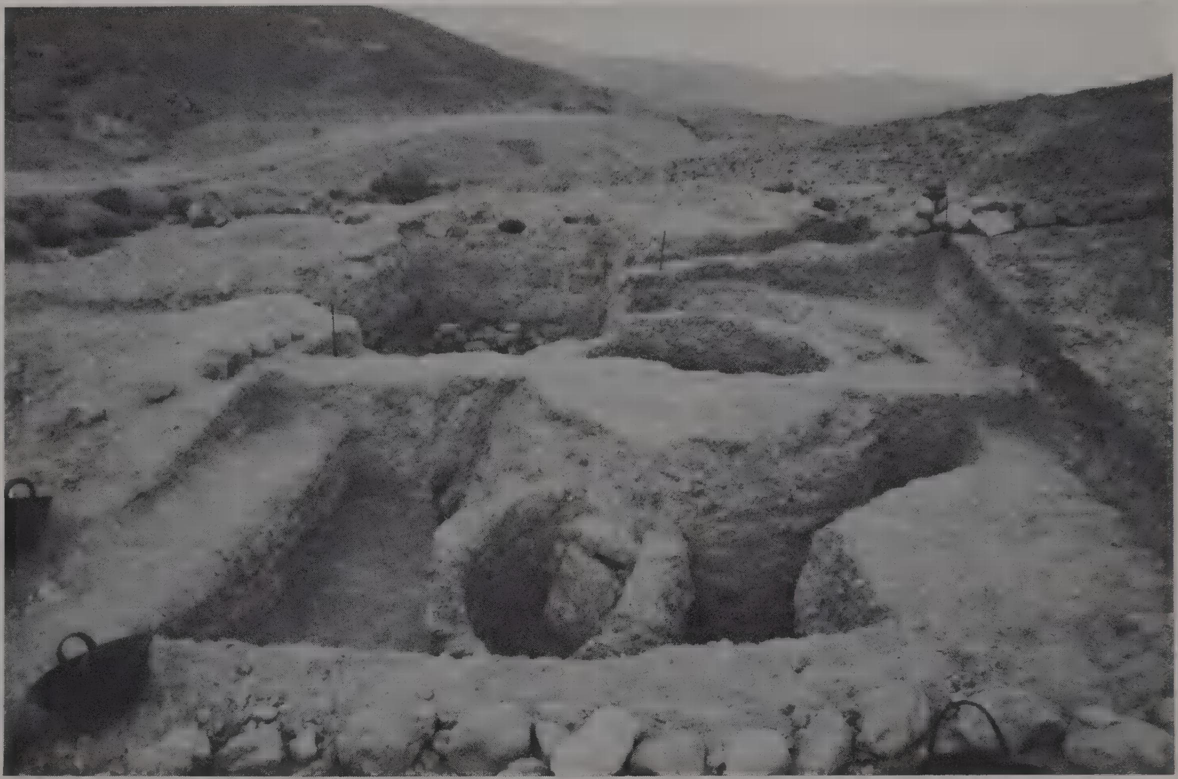


Fig. 25. Charnel House A 56, looking east, worn-down rounded entryway with blocking stone in situ, after excavation of eastern half of house had begun.

way, similar to that of Tomb G 1, was flanked by orthostats with a lintel, threshold stone, and large blocking stone found in situ. The walls of the mudbrick forecourt were straight but rounded at the corners and still closed, simulating a shaft entryway.

The inside of the house was completely filled with collapsed mudbrick and erosional layers of sand and gravel. Most of the erosion, as revealed in the slanted layers of the central balk maintained during excavation, had come from the higher levels to the south. The shape of the roof of the building was problematical. There was no evidence of beam or wood impressions in the debris. If the slope of the corbelled walls is projected on the same curve there would have been a diameter opening of 1 m at the present surface. Several large, flattened stones, 0.50-0.60 m in length, were found in the lower debris among the skeletal material, but their position close to the circumference of the wall suggests that they were part of the erosional collapse debris filling the tomb from south to north rather than a roofing which would more likely have fallen into the center of the tomb.

Two levels of burials were separated near the floor of the tomb. Five burials were identified in the upper level (fig. 26) and four in the lower level (fig. 27). Evidence for primary articulation was present in the upper layer, but all of the adult vertebrae in both levels were at least semi-articulated. It seems likely, following the pattern in other EB II-III charnel houses, that the burials were originally articulated and that the earlier burials were pushed aside when the later burials were deposited. Thirty-six whole ceramic forms were recovered with small ear-lug, narrow-neck juglets and Abydos jugs being the most distinctive. The limited nature of the group and its integrity present a well-defined collection of EB II pottery, in contrast to the mixed groups of EB II-III pottery found in the larger rectangular charnel houses.

Summary of EB IB-II Tombs

It is certainly possible to overemphasize the idea of transition by imposing an evolutionary development of types. The evidence from the 1977

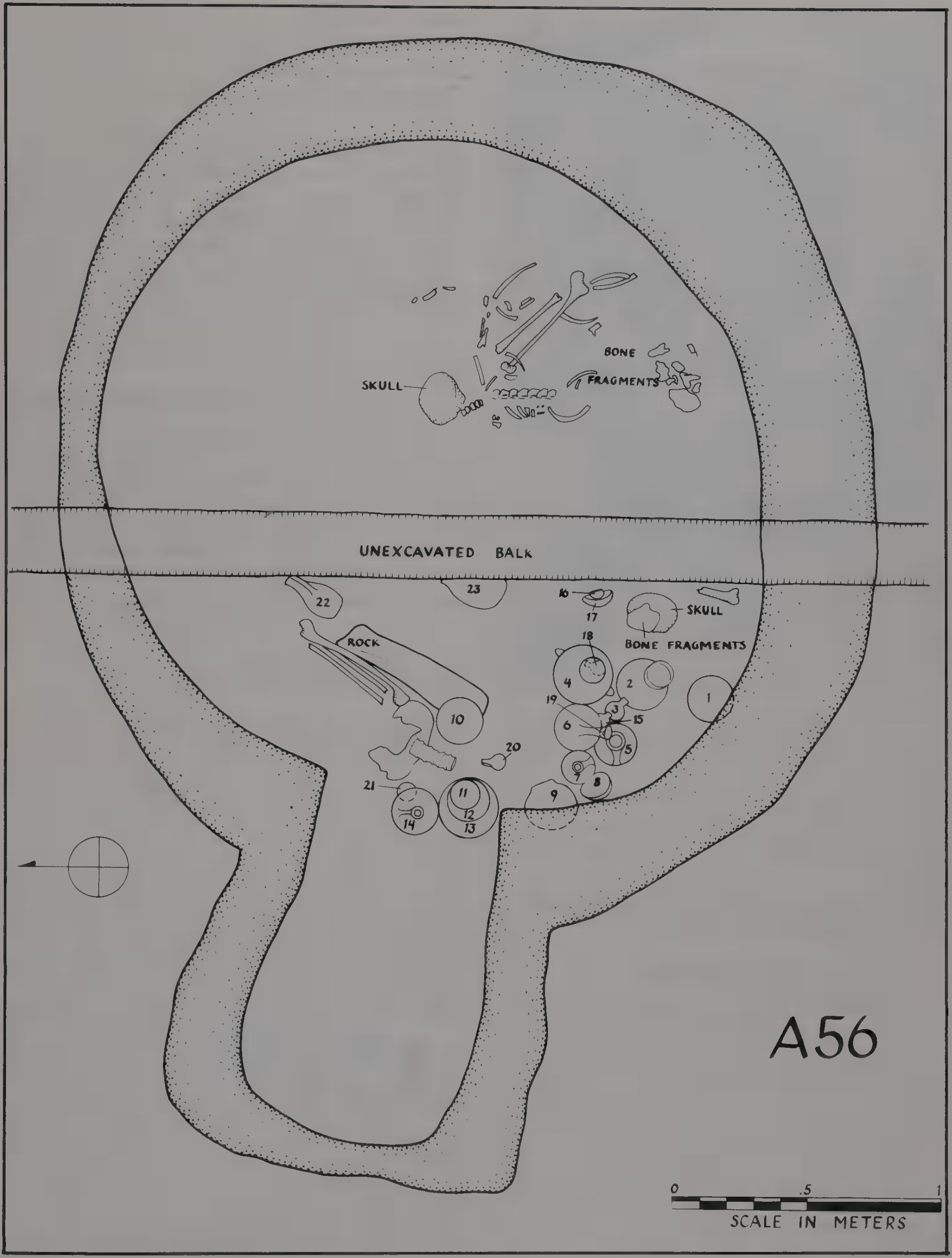
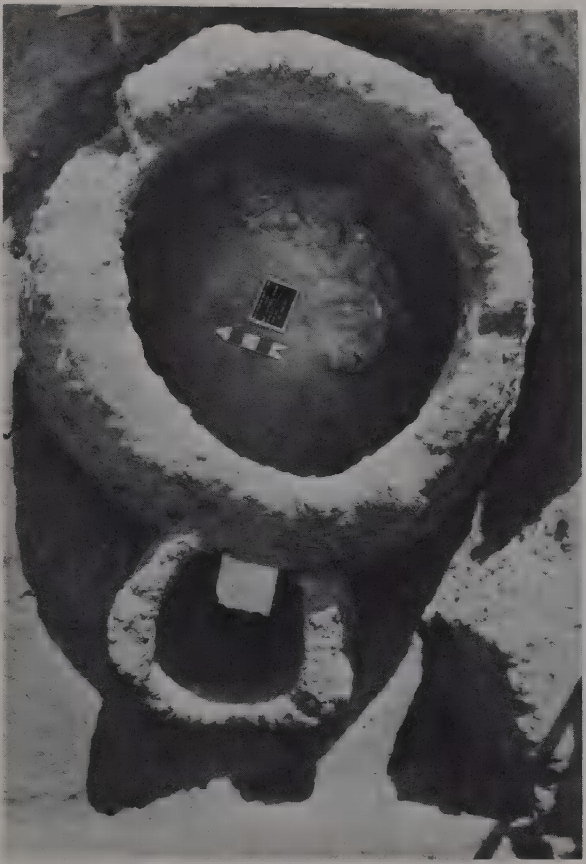


Fig. 26. Plan of upper level of Tomb A 56.



excavations, however, especially that of the ceramic types and the burial practices, together with the results of previous excavations, appears to call for an hypothesis of developmental stages. Tomb G 2 is similar in most aspects to the EB IA chambers, but it is a single chamber and contains ceramic forms which became common in EB IB. Tomb A 100 N, again a shaft-tomb chamber with continuing EB IA forms, is similar to the earlier tombs, but it also contains line-group painted pottery, an articulated burial, and a unique stone platform. Tomb A 88 Lower is the most advanced in its ceramic forms and contains a number of disparate burials contrary to the established and uniform EB IA pattern.

All of these chambers reflect changes in burial patterns which become more pronounced in the cases of Tombs G 1 and A 56, which are partially above-ground tombs, larger in size, and more accessible. The latter features merge well with the evidence from the town site that a permanent settlement was being established during EB IB, leading to the walled city of the EB II-III period of Bab edh-Dhra.

Fig. 27. Ladder view of Charnel House A 56 after removal of balk showing lower burial level. Arrow points to north.

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Ceramic Sequences in the Tomb Groups at Bab edh-Dhra

R. Thomas Schaub

The line-group painted pottery tradition has been recognized as crucial in establishing the cultural sequences introducing the Early Bronze Age in Palestine, ever since it was discovered in quantity in a tomb on Mt. Ophel in Jerusalem and in the early stratigraphic phases at Jericho. During the 1977 excavations in the cemetery at Bab edh-Dhra, three new tombs were excavated containing line-group painted pottery. The significance of this material calls for its rapid publication in this preliminary report.

Earlier preliminary reports by Paul Lapp on the 1965-67 excavations at Bab edh-Dhra also mention three tombs with line-group painted pottery (Lapp 1970: 36). Lapp designated these groups as EB IB because of their stratigraphic relationship to the predominant EB IA tomb groups. The latter have comprised over 85% of the ceramic finds from the early use of the cemetery. These tombs, in both type and in their artifacts, retain a certain uniqueness without strong parallels elsewhere in Palestine. The tombs with line-group painted tradition, however, provide a firmly established link with other Palestinian material.

A number of other factors also contribute to the overall importance of the early Bab edh-Dhra ceramic sequence presented below. (1) Over 2,000 vessels, belonging to EB I, including 800 from the 1977 season, have been retrieved in scientific excavations. This large sample provides a valid basis for statistical analysis and determination of typical forms. (2) The integral nature of the early shaft tomb chamber groups, with relatively small groups of vessels, offers the strong possibility of establishing a sequential relationship among the forms in different tombs. This contrasts favorably with the large cave tombs of Tell el-Far^{c}ah (N), Ai, Jericho, and Azor where multiple successive burials in communal tombs apparently extended over a much longer period of time. (3) The extensive use of the Bab edh-Dhra cemetery, resulting in a number of overlapping tombs, provides the necessary stratigraphical evidence for sequential typological studies.

To illustrate the Bab edh-Dhra sequence, two representative groups of the EB IA traditions have been presented below along with two of the chambers with line-group painted pottery. A fifth group from an early EB II charnel house completes the sequence. The proposed transitional nature of the line-group painted pottery, supported by the stratigraphical evidence and burial practices (see above), is confirmed by a typological study stressing presence and absence, and comparative evidence from the Jericho tombs which illustrate a similar sequence.

Pottery

Tomb A 78 NW-SW

The pottery from A 78 SW (figs. 1-2) and A 78 NW (figs. 3-4) is representative of the EB IA tombs at Bab edh-Dhra in ware, construction techniques, decoration, and form.

The clay is high in iron-lime content. Paste texture varies from fine to coarse but is generally fairly fine. Inclusions range from fine (0.12-0.25 mm) to granule size (2-4 mm) and in color are generally black or white with some grey to reddish brown particles. A thorough chemical analysis of all the wares is being carried out by R. H. Johnston and will be included in the final report. The range of ware colors varies from 10 YR 7/4 ("very pale brown") to 2 YR 6/6 ("light red"). The predominant ware colors are 5 YR 7/6 ("reddish yellow") and 5 YR 7/4 ("pink"). Grey cores in the ware are rare.

The vessels are all handmade. The walls of the large and medium bowls are coil-formed, built up from flat, pancake bases. Fingerprints and grooves smoothing out the coils are frequently evident. The tall cylindrical necks of the jars and juglets have been made separately and then joined to the body of the vessels (the drawings have a line suggesting this join only in the more evident cases but note the ware descriptions). This technique is especially characteristic of the EB IA vessels. In the EB IB groups the more common technique is to draw the neck up from the body of the vessel resulting in a smooth curve from body to neck and generally a shorter and more flaring neck.

The handles on the juglets and jars are usually elliptical in shape in the center and flattened with a wider section at the attachment to the vessel. A slight circular depression is found frequently in the base of the round-based juglets and jars, apparently for better stability (figs. 1:3, 6, 9; 3:6, 7).

With one exception all of the vessels in A 78 NW have a red slip and 7, mostly bowls, are burnished. The exception is the juglet (fig. 3:7) which has a red "splotched" wash. This vessel and the similar one in A 78 SW (fig. 1:9) are the first examples having this type of surface treatment from Bab edh-Dhra. The technique is reminiscent in effect of the "grain-wash" ware of the north but without the distinctive line patterns of the latter. In contrast to the pottery of A 78 NW, only 11 of the 20 vessels in A 78 SW have red slips and only 2, both bowls, are burnished. Similar variations, with some chambers having only a few slipped and/or burnished vessels, are common among the EB IA tombs at Bab edh-Dhra. Given the common technique of red slip and burnish in EB II, Kenyon has argued that these techniques are a later development in the Proto-Urban period (Kenyon 1960: 5). A comparative study of the types and finishes at Bab edh-Dhra suggests the opposite (Schaub 1973: 218). The EB IB tombs groups generally have a much smaller percentage of slipped and burnished vessels than the EB IA groups (see the remarks below on the comparative types of the EB I-II periods).

Plastic decorative techniques include punctured bands around the circumference, bands of clay raised on the surface and then slashed, and dots of clay added in rows (figs. 2:2, 4) or placed intermittently with raised slashed bands (figs. 2:3, 3:2-12).

The small dots or protuberances are pierced on occasion, perhaps for suspension by string. Ledge handles may be plain, thumb-impressed, slashed, or notched with no chronological succession evident since the different treatments may appear in the same chamber (fig. 1:1, 2).

Table 1 offers comparative estimates on the time needed to construct and finish the various vessels of the EB IA typology. The table is based on a careful study of the vessels of A 91 E by R. H. Johnston with similar estimates applied to the A 78 groups. Depending on work habits, an EB potter probably would have spent three or four days on the average size tomb group.

The basic typology of the EB IA chamber groups is simple and fairly consistent. Medium large (over 20 cm tall) flat-based, wide mouth jars (fig. 1:1-2) occur in over 70% of the chambers. Some tombs, as A 78 SW, have more than one example of this type but single occurrences are much more common. Two-thirds of these jars have ledge handles with the remainder either without handles or in a few cases with loop handles. Medium jars (13-20 cm tall) with round, flattened (fig. 1:3) or disc bases (fig. 3:1), wide mouth and tall necks with loop handles, appear in 90% of the chambers in one or more examples. These vessels frequently are the most carefully made of the tomb groups with thin walls and symmetrical shapes. Juglets, again with tall neck and wide mouth, with a looping handle from mid-vessel to the rim or slightly below, occur in numerous examples in most chambers (fig. 1:6-9; 3:2-7). These juglets vary in size from 15 cm to 7 cm but generally are larger in volume than the typical high loop handle juglets found at Jericho, Far^{c}ah (N) and Azor EB I tombs (see comparative study below).

The wide, deep bowls are one of the most distinctive forms of the Bab edh-Dhra repertoire (figs. 2:1, 3, 5, 7; 4:1-4). The finished quality of these bowls varies widely, even in the same chamber, from beautifully shaped forms with slip and burnish to crudely shaped, off-keel, squashed forms with rough, unfinished surfaces. Most frequently the rims of the bowls are slightly everted and thinned, but plain or slightly beveled forms also occur. Medium large bowls (fig. 2:6; 3:8-12) follow a similar pattern. The pronounced inward curve of the wall and narrow base of the two bowls in A 78 SW (figs. 2:2, 4) appear in 30% of the chambers. Medium to small bowls include forms with disc (fig. 4:5) and shallow ring bases (figs. 2:9; 4:6, 7). The smallest saucer bowls generally have rounded bases.

Summary of the Basic Typological Features of the EB IA Pottery

(1) Large jars—tall neck, wide mouth, frequently with ledge handles.
(2) Medium jars—medium-tall neck, wide mouth, small loop handles from shoulder to below rim.
(3) Juglets—tall neck, wide mouth, loop handles from mid-vessel to below rim.
(4) Large to medium bowls—deep profile, rim frequently everted; some examples with incurved walls; functional ledge handles infrequent.
(5) Small bowls—round hemispherical bowls most frequent; ring and disc bases occur.
(6) Consistent decorative features—puncture and raised slashed bands around circumference of the necks of large and medium jars and below rim of bowl forms.
(7) No spouted vessels.
(8) No narrow neck vessels.

EB IB Pottery

Tomb A 100 N (figs. 5-8)

The pottery of the north chamber of A 100 is similar to the vessels of A 78 SW and NW in ware and in the basic typology of large, wide mouth jars, wide mouth loop handled juglets, wide deep bowls, and small bowls. It also includes different construction techniques, surface treatment, and distinctive forms which are typical of the EB IB tomb groups at Bab edh-Dhra and at other sites in Palestine.

The color range of wares of A 100 N is similar to that of A 78 SW and NW extending from "very pale brown" (10 YR 8/4) to "light red" (2.5 YR 6/8) with the predominant color (19 vessels) "pink" (7.5 YR 7/4) - 5 YR 7/4). A 100 N has a larger number of vessels in the "white" to "very pale brown" (10 YR 8/2 - 10 YR 8/4) range while the A 78 chambers have more vessels in the "light reddish brown" to "light red" categories (2.5 YR 6/4 - 2.5 YR 6/8).

The vessels are again all handmade. Bowls are coil formed but generally less well shaped and finished than those of A 78 SW and NW. Joined necks are found on the large jars but are less cylindrical in shape, and the curve from body to neck is smoother. Only one of the juglets (fig. 6:3) has a joined neck. All of the other juglets, generally smaller in volume, have a shorter neck and smooth curve from body to neck. With one exception (fig. 6:10) all of the handles of the juglets have been pulled higher above and attached to the rim from above. The section of the handles is frequently round. The same technique is found on the large loop-handled jar (fig. 5:4), although the smaller handles are flattened in section. None of the juglets have the flattened base with circular depression typical of the EB IA groups.

Red or reddish-brown slip covers the surface on 11 of the 34 vessels. Slipped vessels include the medium sized jars, 1 of the amphoriskoi, a large juglet (the latter 2 are the only 2 burnished vessels, fig. 6:1, 3), 2 of the spouted bowls and most of the small bowls. The most distinctive difference in surface treatment is the line-group painting on the amphoriskoi (fig. 6;2) and the medium sized bowl (fig. 7:5). The latter contained the fragile remains of a wooden bowl with flat rim.

None of the vessels have the punctured bands or slashed bands so typical of the EB IA tomb groups. "Potters' marks," incised before firing, include incised lines on the large jar (fig. 5:1) and the split reed marks (fig. 5:2, 3; 7:1-4) on large jars and bowls. The former is typical of similar marks found on EB IB vessels. The latter were encountered for the first time this season in this tomb and in A 88 L (see below).

Distinctively different forms include the spouted bowls (figs. 5:5-8), the ear-handled amphoriskoi (fig. 6:1-2), the beak-handled spoons (figs. 6:12-13), and the horned cup (fig. 6:11). The spouted bowls and amphoriskoi are typical of the EB IB groups (see comparative study below). Small spoons have been found in some of the EB IA tombs, but these examples are the first having a beaklike projection on the handle. The incised lines on the back of one of the spoons (fig. 6:12) convey the impression of a design pattern of bird feathers. Similar spoon handles with a beak handle were found in stratified EB IB contexts in the town site. The small cup with horned handle (fig. 6:11) is the first example of this type encountered at Bab edh-Dhra. Similar cups are common at Safi (Rast and Schaub 1974, fig. 5:113-15) and Feifeh (unpublished). The appearance of the type at Bab edh-Dhra further supports the suggested early contact between the populations of these sites.

None of the large bowl forms, generally cruder in shape and construction, have the typical everted rim of the EB IA types. Also, none of the juglets or amphoriskoi have the narrow necks typical of these forms in EB II.

The basalt bowl (fig. 8) is similar to forms found in EB IA tombs but is simpler, without flaring rim or necklace band decoration.

Tomb 88 L (figs. 9-17)

Although there is considerable repetition among the vessels of A 88 L, the entire group is presented here for comparative purposes with A 100 N and other EB IB groups in Palestine.

The size of inclusions in the pottery ranges from small (0.2-0.5 mm) to large (5.0-8.0mm). Two broad categories may be distinguished and correlated favorably with types. Small to medium inclusions (0.2-2.0 mm) are generally found in the spouted bowls, cups, and medium to small bowls. Small to large inclusions (0.2-8.0 mm) are found in the large jars, small jars and juglets, and the large bowls. The lamp form and some of the more crudely made small bowls also include fairly large inclusions.

The predominant color of the vessels is orange-tan to brown-tan (2.5 YR 6/4, "light red," to 5 YR 6/6, "reddish-yellow"). Brown and reddish-brown colors also are represented.

Of the 95 pots, 24 are slipped. Among the slipped vessels are: (1) the column-handled jar (fig. 9:4) and ledge-handled jar (fig. 9:3); (2) the medium sized jars with loop handles (fig. 9:5, 6; 10:1); (3) 1 of the spouted bowls (fig. 10:5); (4) several of the juglets and small jars (fig. 11:5, 6, 13, 14); (5) the medium bowls with incurved sides (fig. 14:6); and (6) 9 of the smaller bowls, including 2 of the disc based bowls and 3 of the omphalos bowls. Only 1 vessel, a small jar, (fig. 11:1) has evident marks of burnish. Line-group painting occurs on 9 of the 13 spouted bowls (fig. 10:2-14) and on the amphoriskoi (fig. 11:10). A small bowl with lug handles has broad radial stripes painted on the inside (fig. 16:21). Puncture decoration reflecting continuity or overlap with the EB IA material occurs on 3 of the large and medium jars (fig. 9:3, 5, 6), on 3 small jars (fig. 11:3, 6, 9), and on 3 of the large bowls, including the large spouted bowl (fig. 12:6; 13:3; 16:22). Incised line potters' marks, common in other EB IB tombs at Bab edh-Dhra, appear on 14 of the bowl forms, on the inside and outside of the vessel walls or on the base.

Construction techniques are similar to those found in A 100 N. This is especially evident in the smooth curve from body to neck in jars and juglets (except for the tall, wide, flaring neck in the medium sized jars) and in the handles attached from above in jars and juglets. The most noticeable difference is the pushed-in omphalos base of some of the small bowls (fig. 16:16-20; 17:1-2). The duck-bill ledge handle of the medium jar (fig. 9:3) should also be noted. This elongated type of handle, frequently in line with the bottom slope of the vessel, occurs in other EB IB groups at Bab edh-Dhra as well as in the earliest EB IB occupational levels of the town site.

In the basic typology of tall neck, wide mouth jars and juglets, and wide deep bowls the similarities to the EB IA groups are apparent. Similarities to the new types represented in A 100 N are also evident, but a number of additional forms and some differences are present. The large jar with pierced column handle (fig. 9:4) is a type well known from other EB IB contexts. The series of omphalos bowls, especially common in the Tell el-Farah (N) and Azor groups, is an important addition beyond the A 100 N group (fig. 16:16-20; 17:1-2). The fairly shallow and wide, medium bowl forms (fig. 15:3-8) occur rarely in the EB IA tombs but are common in the EB IB groups. Filling out the typological series is a group of small jars, including seven with small loop handles from shoulder to rim (fig. 11:1-9). It should also be noted that the juglets are typically smaller in volume than the EB IA types and that all 17 of the large, deep bowls have functional ledge handles below the rim. The deep bowl form with incurved sides (fig. 14:4) continues a type frequent in EB IA. However, only two examples of the medium bowls with incurved walls and ledge handles (fig. 14:5, 6; 15:9) have been found in the EB IA tombs. These forms occur in all of the EB IB groups. The lamp (fig. 17:4) with four slight thumb impressions on the rim may be one of the earliest appearances of this form. Saucer forms with burn marks on the rim occur at Tell el-Farah (N) and Azor in the EB I tombs (Ben-Tor 1975: fig. 6:1, 2) but published forms of lamps with thumb impressions are all from EB II-III contexts (Schaub 1978: fig. 12a, b). A similar example was found in the EB II round charnel house, A 56 (see below).

Tomb A 88 L also contained two stone vessels. One (fig. 17:9) is the first example from Bab edh-Dhra tombs of a sandstone vessel. The second (fig. 17:10) is an unusual rounded form of basalt. Both vessels had simple profile without the flaring rim of the EB IA forms.

The three maceheads are similar to those found in EB IA tombs. Macehead No. 1 (fig. 17:7) is alabaster. It was found next to jar P 13 (one of the jars with puncture decoration). A second macehead was found inside one of the large jars, P 35 (fig. 17:6). The third (fig. 17:5) was broken and is not shown on the tomb plan above.

Tomb G 2

As noted above Tomb G 2 was a single chamber tomb with a disarticulated bone pile. Thirty vessels were contained in the tomb. Among the types represented:

(1) A large, wide mouth jar with smooth curve at the neck—similar to fig. 9:1 without the dots.
(2) An unpainted spouted bowl—similar to fig. 5:5.
(3) A small wide mouth jar—similar to fig. 11:1.
(4) Three small wide mouth jars with loop handles; one with handles attached from above the rim—similar to fig. 11:7; two others with handle attached at the rim—similar to fig. 11:4, 8.
(5) Four juglets, three closer to EB IA types with tall neck, handles attached at rim; one with handles from above—similar to fig. 6:6.
(6) Four deep wide bowls, all with functional ledge handles or knobs—similar to fig. 7:1; three of the bowls have tapered rim, one had a slightly everted rim; one of the bowls has a series of reed marks—similar to fig. 7:1.
(7) A medium deep bowl with tapered rims and functional ledge handles.
(8) Two medium bowls with incurved walls and small ledge handles—similar to fig. 7:6; 14:6; 15:9.
(9) Three medium wide and shallow bowls—similar to fig. 15:6, 7, 8.
(10) A wide, medium bowl with ring base.
(11) Eight small bowls similar to 16:1-12.

The typology thus reflects most of the basic modifications to the EB IA forms observed in the pottery of Tombs A 100 N and A 88 L. It also contains several of the distinctive forms of these tombs: the spouted bowl, the medium bowl with incurved walls, and the medium wide and shallow bowls. The absence of line-group painted vessels, the amphoriskoi form, and omphalos bowls may be accidental, but the typological sequence suggests a tomb slightly earlier than A 100 N.

Charnel House G 1

Reconstruction of the ceramic forms of G 1 is still in progress. Whole forms excavated include several narrow-neck amphoriskoi (one with line-group painting), omphalos base bowls, small wide-mouth juglets with handle attached from above and a medium size bowl with incurved walls.

Summary of the Basic Typological Features of the EB IB Pottery

A. Basic types similar to those of EB IA but with stylistic changes
    (1) Large jars—tall neck and wide mouth; generally a smooth curve from body to neck with flaring rim; the distinctive duck-bill type handle should be noted.
    (2) Medium jars—tall flaring neck, wide mouth; flat, wide handles attached at or above rim.
    (3) Juglet—wide mouth; generally shorter, flaring neck and with rounded base; smaller in volume; handle attached at or from above rim.
    (4) Large bowls—deep profile; rim tapered rather than everted; functional ledge

handles below rim on almost all examples.

(5) Small bowls—hemispherical bowls common; ring bases occur.

(6) Decorative features—puncture decoration occurs on jars and bowls, but infrequently.

B. Different types

(1) Large jars with pierced column handle.

(2) Spouted bowls—generally with incurved walls and flaring or trumpet spout; base may be rounded or flat; frequently decorated with line-group painting.

(3) Medium-sized bowls with incurved rim—probably modeled on the similar-shaped spouted bowls.

(4) Medium bowls—wide and fairly shallow.

(5) Small bowls with omphalos base.

(6) Wide-mouth amphoriskoi—small jars with ear handles on shoulder at neck.

(7) Narrow-neck amphoriskoi—these forms occur only in Charnel House G 1. It is possible that their form was influenced by the technique of the spout on the bowls. (Cf. the 13 spouted vessels of A 88 L without one narrow-neck juglet being represented.)

(8) Cups—one example of a large, loop-handled cup occurs in the EB IA forms of Lapp's excavations.

(9) Spoons—the handled spoons of A 100 N are paralleled by similar forms found in EB IB occupational levels at Bab edh-Dhra. Two examples, however, with short blunt handles, do occur in an EB IA context from Lapp's excavations.

The evidence above suggests that the ceramic development from EB IA to EB IB at Bab edh-Dhra was a gradual one. At least one can assert that it is not necessary to see the line-group tradition as a totally new innovation imported from outside Palestine. It could easily have developed from the earlier tradition.

In Tomb G 2 the basic typology of the earlier tombs is fully present, but modifications are associated with these types which are dominant in the tombs with line-group painted vessels. One spouted bowl, unpainted, is the most distinctive new vessel.

In A 100 N a series of spouted bowls along with two line-group painted vessels identify this group more closely with other EB IB groups in Palestine. The same modifications of the EB IA forms appear with more consistency.

A 88 L has similar characteristics on an even wider scale. It also contains new forms including a column-handled jar and a series of omphalos bowls. None of these groups has narrow-necked vessels. Given the 95 vessels of A 88 L, this hardly seems accidental. Narrow-necked vessels do occur in Charnel House G 1 (also in two EB IB tombs, A 43 and A 53, excavated by Lapp). It seems feasible that the introduction of narrow-necked vessels, appearing in EB IB and coinciding with the beginning of permanent settlement, corresponds to the development of new agricultural products such as wine and oil (Stager 1976: 12).

The gradual development in the sequence is also supported by comparative study with other Palestinian material.

Comparative Material

Two major difficulties in citing parallels should be noted. The first, in a sense, emerges from too much evidence—the character of the abundant multiple-successive burials in the large tomb groups of Jericho, Tell el-Farah (N), Ai, and Azor. Tomb 94 at Jericho, for example, contained 113 individuals and Tomb K 2 the remains of 340 individuals. These tombs, as well as the similar groups at other sites, were apparently used for a considerable period of time. The Bab edh-Dhra EB I tombs with limited numbers of burials reflect a much shorter time period. The smaller tombs, A 114 A (26 burials?) and A 13 (6 burials) at Jericho and Tomb 9 at Tell el-Farah (N) are much more useful in correlating the material from those sites to Bab edh-Dhra.

A second difficulty originates with the lack of comparative material for the earlier tombs at Bab edh-Dhra. Although isolated individual parallels may be cited, there are no good group parallels. In fact, most of the isolated parallels are closer to the modifications of these forms which continue into EB IB. The early tombs of Bab edh-Dhra maintain their uniqueness. (Some parallels for the forms in these tombs, however, can be found in the stratified layers of the tells at Jericho, Tell el-Farah [N] and Arad [Schaub 1973: 173-215].)

Even allowing for these difficulties a comparative study of the tomb sequences observed at Jericho reveals a gradual development of types during EB I similar to the Bab edh-Dhra sequence.

Jericho Tomb A 94

The earliest tomb in the Jericho proto-Urban sequence is Tomb A 94. It presents an interesting contrast to the tombs of Bab edh-Dhra. The size of the tomb is considerably larger (4.5×5.0 m). The stratigraphy was sufficiently complex to allow for the separation of 8 layers and 5 levels of deposit. Yet the typology of the pottery is fairly uniform. There are 67 complete bowl forms (plus 36 additional partial forms), 52 of which are wide, shallow bowls with walls curved to a rounded or flattened base. Nine of the bowls are small and approximately hemispherical in shape. Six have flat bases with angular sides. There are no deep bowl forms. Sixty-eight juglets are represented (plus 41 additional, partial forms) which are very similar in type: all wide mouth with short, straight to slightly flaring neck, and handles attached from above the rim.

Both of these dominant forms, the wide shallow bowls and small juglets, appear occasionally in the late EB IA tombs at Bab edh-Dhra and become frequent in the EB IB tombs. Other similarities may be found in the small bowl with painted stripes (cf. Kenyon 1960: fig. 11:8 with Tomb A 88 L, fig. 16:21); in the numerous incised lines on the walls of vessels (cf. Kenyon 1960: figs. 9:4, 6, 8, 12-15; 10:6, 8, 9, 11 with Tomb A 88 L above figs. 12:2, 3; 13:1, 2, 4-6; 14:1-3; 15:1-3, 7); and in the occasional puncture design (cf. Kenyon 1960: fig. 9:16; 10:3-5, 7, 10; 11:5, 14 with Tomb A 100 N, fig. 7:1-4).

The jar forms in Tomb A 94 are less uniform in type. There are 6 large, wide mouth jars, 7 small jars, 3 spouted vessels, and a narrow-neck bottle. Most of these forms are closely paralleled in the Tell el-Farah (N) tombs but have only slight familiarity with the Bab edh-Dhra forms. The large jar with two dots on the shoulder has some echo to the Tomb A 88 L example although the latter does not have ledge handles (cf. Kenyon 1960: fig. 14:10 to A 88 L fig. 9:1). The large and small loop-handled jars (Kenyon 1960: fig. 14:12, 13; 15:1) can be compared to the Bab edh-Dhra types (fig. 5:4; 9:5, 6; 10:1; esp. 11:3-9). The jar with loop handles on the shoulder (Kenyon 1960: fig. 14:9) is probably an early development of the wide mouth amphoriskoi (cf. above, fig. 6:2; 11:10).

The necked jars with long spout of Jericho do not appear in the tombs at Bab edh-Dhra. The narrow-necked jar (Kenyon 1960: fig. 14:7) perhaps best illustrates the difficulties in determining type sequence in the large tomb groups which have been disturbed by later burials. This type appears only later in the Bab edh-Dhra sequence (fig. 19:8, below). It should be noted that this vessel is not on the plan of A 94 and is not assigned to any of the levels of the tomb. It appears again in A 13 (II-I) (Kenyon 1960: fig. 22:13), in A 108 with net-painted design (Kenyon 1960: fig. 23:12) and in A 127 (Kenyon 1960: fig. 25:23). It also appears in Tomb 3 at Tell el-Farah (N) listed with the Late Chalcolithic vessels (de Vaux and Stéve 1949: fig. 1, 2).

The comparative evidence from Tell el-Farah (N) is difficult to interpret without the full catalogue of vessels for most tombs. In Tomb 9, a small group with 20 vessels, including deep bowls, there are no narrow-necked vessels or spouted vessels (de Vaux 1951: fig. 4). Tomb 11, a large tomb, apparently has no narrow-necked vessels, or spouted jars, but it does have a spouted bowl along with deep bowls of the grey-burnished tradition (de Vaux 1951: figs. 6, 7). Both spouted bowls and jars are represented in Tomb 8 and Tomb 2 without narrow neck vessels (de Vaux 1949: fig. 6, 13). Spouted jars are associated with column-handled jars and/or narrow-necked vessels in tombs 5, 12, 13, 14, 15, 16, and 17 (de Vaux and Stéve 1949: fig. 2; de Vaux 1951: figs. 11, 12; de Vaux 1952: figs. 10, 11, 12; de Vaux 1955: figs. 1, 3). Tombs 2, 8, 9, and 11 could be seen as supporting the Bab edh-Dhra evidence that the narrow-necked vessel was introduced after the spouted bowls and jars. Tomb 3, however, with narrow neck vessel and without spouted vessels, suggests the opposite. On the basis of bowl sequence, Wright has argued that Tomb 3 is the earliest of the Tell el-Farah (N) tombs (Wright 1958: 43). Accepting this hypothesis (which has been rejected on other grounds by Lapp [1970:

108]) would mean that the narrow-necked vessel was introduced early but is not present in the later Tombs 2, 8, 9, and 11. Callaway presents another possibility by separating the lower layers of A 94 (V, IV-III) into an earlier phase (Callaway 1964: 53). A second phase would include A 94 (II-I) and all of the Tell el-Farah (N) tombs. This solution has the merit of recognizing the difficulties in determining type sequence in the large tomb groups and allowing more latitude in the development of the forms. It does not solve the problem of the narrow-necked vessels. At this point in the development of the Early Bronze Age, it is obvious that there were some regional differences in the development of types.

Given the absence of the line-group painted vessels in Tomb A 94 and the comparisons cited above, it is possible generally to situate Jericho Tomb A 94 as close to but preceding the EB IB tombs at Bab edh-Dhra. Most of the EB IA tombs at Bab edh-Dhra would thus be earlier than A 94.

Tomb K 1

Tomb K 1 has only a small group of vessels. The wide shallow bowls correspond to those in A 94. One vessel, the flat-based cup with flaring rim (Kenyon 1965: fig. 12:6), is closely paralleled in the EB IA tombs of Bab edh-Dhra where similar vessels are obvious imitations of stone jars (Lapp 1968: fig. 10:8 and fig. 9:st. 1).

Tomb K 2(I)

The early phase of K 2 at Jericho also has vessels which reflect EB IA forms at Bab edh-Dhra, but they are types which continue into EB IB. The tall juglet (Kenyon 1965: fig. 4:19) with handle attached below the rim is quite close to some of the early typical juglets of Bab edh-Dhra with a shorter flaring neck (cf. Lapp 1968: fig. 8:1, 4 but also fig. 11:11 above). Ring base bowls are fairly common in the early tombs (Lapp 1968: fig. 8:2, 3 and above, fig. 2:1) but also continue in the EB IB tombs (above, fig. 7:7, 8; 16:13, 14).

The K 2(I) examples of other vessels are also closer to the EB IB types. The deep bowl with splayed walls (Kenyon 1965: fig. 4:10) adds another form more typical of the EB IB tombs; also the juglet forms with handle attached from above; the small jar forms (cf. Kenyon 1965: fig. 4:35 with fig. 11:3-8 from A 88 L above); and the bowl forms with broad, painted stripes (cf. Kenyon 1965: fig. 4:3, 7, to fig. 16:21 above as well as to the painting on some of the spouted bowls, fig. 10:10, 12, 14 above).

Although Kenyon assigns K 2(I) to the Proto-Urban A group, many of the forms reflect types in the EB IB groups at Bab edh-Dhra. If the narrow-necked bottles of K 2(I) are intrusive, as Kenyon suggests (1965: 13), this tomb is still closer to the EB IB groups at Bab edh-Dhra and yet slightly earlier because of the absence of line-group painted vessels.

Tomb A 114 (A)

Although there are still no line-group painted vessels in A 114 (A) most of the vessels of this tomb present even closer parallels to the Bab edh-Dhra EB IB groups. The wide, deep bowls with straight sides (Kenyon 1960: fig. 17:20-22 with above, fig. 7:3, 4; 12:1-3), wide shallow bowls (cf. Kenyon 1960: fig. 17:1-4, 6 with above, fig. 15:3-7), some of the juglets (cf. Kenyon 1960: fig. 18:2, 4 with above fig. 6:5-10; 11:11-15), and the ring base bowl (cf. Kenyon 1960: fig. 17:18 with above, fig. 7:7; 16:13-15) all continue forms appearing in A 94, K 1, or K 2(I).

Several new forms which appear also in the EB IB tombs at Bab edh-Dhra reflect further development. The spouted bowl (fig. 17:24) is the most distinctive new form (cf. the single occurrence of this form in G 2 above). Just as striking are the wide mouth jars with lug handles at the neck line (Kenyon 1960: fig. 18:11, 12, 14), which are exactly paralleled by the jar of A 100 N (fig. 6:1, above) and are similar to the forms with line-group painting (fig. 6:2; 11:10). In addition the occurrence of an omphalos bowl (rare at Jericho but frequent at Tell el-Farah [N] and Azor) corresponds to these forms appearing in A 88 L (cf. Kenyon 1960: fig. 17:17 with A 88 L above, fig. 16:15-20; 17:1, 2). The two narrow-necked bottles appear earlier than in the Bab edh-Dhra sequence but suggest the development of this type also before line-group painting was introduced.

Tombs K 2(II) and A 13 (I-III)

These tombs appear as close contemporaries of the A 100 N and A 88 L groups. The parallels are so complete that comment is hardly necessary. The painted design on bowl forms is exactly similar (cf.

Kenyon 1960: fig. 22:4 and 1965: fig. 7:1 to above, fig. 7:5). Even an incised-line potter's mark reflects the same symbol (cf. Kenyon 1960: fig. 22: 1 to fig. 12:2; 13:5 above). The bowls with incurved walls (cf. Kenyon 1960: fig. 22:2 to above, fig. 14:6; 15:9), the column-handled jars (cf. Kenyon 1965: fig. 9:2-5 to above, fig. 9:1), and the narrow-necked amphoriskoi of K 2 and A 13 complete the sequence, with all of the new types represented in the EB IB sequence at Bab edh-Dhra appearing in these tombs also. Spouted jars with basket handle also appear in Tomb A 43 at Bab edh-Dhra.

In support of the hypothesis that the EB IB line-group painted tradition developed gradually from the preceding pottery traditions two factors should be emphasized: (1) the forms on which line-group painting typically occurs appear in earlier tomb groups without line-group painting (jars with ear handles in A 114 (A); spouted bowls in G 2 of Bab edh-Dhra, A 114 A, and the Tell el-Farah (N) tombs; the medium deep bowls in K 2(II); and even the narrow neck amphoriskoi in A 114 (A); (2) broad-stripe painting also occurs on a number of forms, usually medium bowls and jars (Kenyon 1960: fig. 11:18, 15:2; 1965: fig. 4:3, 7 and 13:4, 7), before line-group painting appears and probably should be seen as a precursor of the line-group painted tradition.

The comparative study thus suggests that the Jericho tombs reflect the same gradual development of types during EB I which occurs at Bab edh-Dhra. There is no need to conclude that the Proto-Urban B group is introduced from outside Palestine. Hennessy has postulated a possible connection between the late Ghassulian phases and Proto-Urban B culture (1967: 17-18). The evidence discussed above remains open to this alternative explanation of a gradual intermingling of the Palestinian cultures.

Tomb A 56

The round charnel house, A 56, shares some of the valuable characteristics of the shaft tomb chambers of Bab edh-Dhra. It is fairly small with only nine burials; it also was discovered intact, well sealed by roof collapse and certainly not disturbed in recent times. The pottery represents a well-defined group dating to the beginning of EB II.

The paste of the pottery includes particles which generally are in a smaller range than in the EB IB groups. The wide mouth jars (fig. 18:1-4) and one of the platters (fig. 20:7) have inclusions ranging from 0.2 to 3.5 mm. Two of the narrow neck jugs (fig. 18:5, 19:1) have the largest inclusions, 0.2 to 6.5 mm. Almost all of the other forms have inclusions ranging from 0.2 to 2.0 mm.

The predominant color range is from "reddish yellow" (5 YR 7/6) to "pink" (7.5 YR 7/4). A few wares are "light red" (2.5 YR 6/8) or "light brown" (7.5 YR 6/4).

Twenty of the 35 vessels are slipped and 8 others, all small ear-handled juglets, have traces of net-painted design. Most of the slipped vessels are also burnished. Exceptions include 2 of the large jugs (fig. 18:5, 6) and 3 small bowls (fig. 20:6-8). The nonslipped vessels are the large jug (19:1), 4 ear-handled juglets (fig. 19:7, 8, 17 and Reg. No. 901, not drawn), the ring-based bowl, the lamp and the chalice (fig. 20:10-12). Slip color varies from "light red" (2.5 YR 6/6) to "red" (7.5 YR 5/6). One of the bowls (fig. 20:9) has a "strong brown" slip (7.5 YR 5/6).

The vessels are all handmade. The major constructional technique change is the obvious dominance of narrow-necked vessels. The tall necks have been joined to the body of the vessels in most instances, but two of the wide mouth jars (fig. 18:1, 4) have smooth curves at the neck and short flaring rims. Loop handles on jugs and juglets have been attached from above the rim.

The typology of the vessels reflects considerable change from the EB IB groups but continuity is still present. The wide mouth jars are more global in shape with higher shoulder. The ledge-handled and loop-handled jars (fig. 18:2, 3) have sharply defined necks. The ledge handles are wider and more narrow than earlier types. The loop handles on the side of the jar are a new development and are distinctive of the EB II period.

The narrow-necked, ear-handled juglets reflect the strongest continuity with EB IB types. Narrow necks on jugs and loop-handled juglets are new forms in the Bab edh-Dhra sequence and become typical of EB II-III forms. Forms most noticeably absent in relation to the previous period are the wide, deep bowls and the spouted jars. The function of the latter may have been taken over by the narrow neck jugs, although there are a few rare occurrences of spouted jars in the EB II-III tombs. The wide, shallow platters also continue as a dominant form throughout EB II-III. Both changes probably reflect adaptations to the settled town life.

All of these forms appear in other EB II contexts in Palestine, reflecting the cultural unity which is characteristic of the EB II-III periods in Palestine. The A 56 tomb group is close to Tomb A 108 at Jericho. The wide platter bowl with rounded base (fig. 20:2) is comparable to the carinated platters of A 108 (fig. 23:1-4) although it is reflected in earlier forms also (Kenyon 1960: fig. 10:14). Flat-based platters with thickened or inverted rim appear in Tomb A 127 at Jericho (Kenyon 1960: fig. 25:4, 5, 6, 8), but A 56 does not have any of the tall, narrow, flat-based juglets of this tomb. Tomb A 56 may be assigned to early EB II. Presuming continued development from EB IB, an undetermined time period probably separates this tomb from the earlier ones.

Archaeologists have been far from unanimous in their chronological designations of the line-group tradition in relation to the better-known red and grey burnished pottery of the Jericho and Tell el-Farah (N) tombs. De Vaux preferred the term Late Chalcolithic for the red and grey burnished traditions. He recognized the line-group tradition as partly contemporaneous with the red and grey burnished pottery, and was willing to accept the term EB IA for the line-group tradition as leading to the new urban culture of the full Early Bronze Age (de Vaux 1970: 536; 1971: 212). Kenyon also recognized the later introduction of the line-group tradition but underscored their general contemporaneity by designating the three traditions, red, line-group and grey, as Proto-Urban A, B, and C (Kenyon 1960: 8-9). Wright insisted on the chronological sequence, preferring the terminology EB IA for the red and grey burnished and EB IB for the line-group tradition (Wright 1961: 82). Although differing in terminology, the three scholars agree concerning the later introduction of the line-group tradition.

The Bab edh-Dhra evidence, both stratigraphical and typological, also reveals the line-group tradition as emerging between the earlier EB IA pottery tradition and that of the urban phase in EB II. The cultural relationship of the line-group tradition to the preceding and following periods is still debatable, but the present ceramic evidence from Bab edh-Dhra seems to favor the hypothesis that it developed gradually from the preceding culture and provides a valid link leading to the EB II culture. Thus the EB IB terminology, first suggested by Wright for the line-group painted tradition and defended by Lapp in his early reports on Bab edh-Dhra, has been retained.

Table 1

Type	Reg. No.	Estimated Construction Time (minutes)	Estimated Finishing Time (minutes)	Total Time
Tomb A 78 SW				
Large Jar	503	95	30	125
Medium Jars	529	60	20	80
	508	60	25	85
Small Jars	518	45	15	60
	526	40	15	55
Juglets	527	40	20	60
	528, 517	35	20	110
	516	35	15	50
Large Bowls	504, 502	90	30	120
	511, 505	80	30	220
Medium Bowls	509, 512	60	25	170
	719	50	20	70
Small Bowls	514, 522	35	20	110
	524, 513	25	10	70
				1,505 24 hrs. 05 min.
Tomb A 78 NW				
Medium Jar	473	60	25	85
Juglets	515, 523, 520, 525	40	20	240
	531, 578	35	20	110
Medium Bowls	475, 476, 459 510, 471, 472	50	20	420
Medium Large Bowls	506, 507	60	25	170
Large Bowls	501	100	35	135
Medium Small Bowls	474	40	20	60
Small Bowls	521, 530	35	15	100
				1,320 22 hrs.

Pottery Descriptions

Fig. 1. Tomb A 78 SW

No.	Pot No.	Reg. No.	Ware Description
1	10	529	pink surface color (5 YR 8/3); few large and some small white inclusions; gray patching; 2 ledge handles; complete; joined neck.
2	13	503	pink ware (7.5 YR 7/4) with light red slip (2.5 YR 6/6); few large black and white and many small black inclusions; moss green patching; line of incised holes and 3 small raised knobs below exterior rim; loop handle below each knob, line of incised holes at neck joint interrupted by bases of handles; 2 ledge handles with thumb impressions; one ledge handle chipped; joined neck.
3	5	508	reddish yellow ware (5 YR 7/6) with pinkish white surface color (5 YR 8/2) and light red exterior slip (2.5 YR 6/6) and slightly into interior; some small white inclusions; gray patching; line of incised holes below exterior rim interrupted by top attachment points of 2 loop handles; slip rotted; joined neck; slight circular depressed ring in base.
4	11	526	pink ware (5 YR 7/3) with surface color from pink (5 YR 8/4) to yellow white ("pinkish white" 7.5 YR 8/2); many medium black inclusions; gray patching; chipped rim; deep join line in interior neck; poorly made.
5	9	518	surface color from light red (2.5 YR 6/6) to tan ("pink" 7.5 YR 7/4); many large white inclusions; gray patching; complete; joined neck.
6	17	528	pink ware (5 YR 7/4) with light red exterior slip (2.5 YR 6/6) and slightly into interior rim; some small black and white and a few medium white inclusions; slightly chipped rim; joined neck; circular depression in base.
7	7	517	greenish white surface color ("very pale brown" 10 YR 8/3) with traces of light red slip (2.5 YR 6/6); light gray patching; complete except for slightly chipped rim; joined neck.
8	2	516	orange ware ("pink" 5 YR 7/4) with pink surface color (5 YR 8/3); some medium black and white inclusions; light gray patching; slightly chipped rim; joined neck.
9	15	527	pinkish white ware (5 YR 8/2) with surface color from pink (5 YR 8/4) to white (10 YR 8/2); red wash splotched on exterior (2.5 YR 5/6) and slightly into rim; gray to black patching; chipped rim; joined neck; circular depressed ring in base.

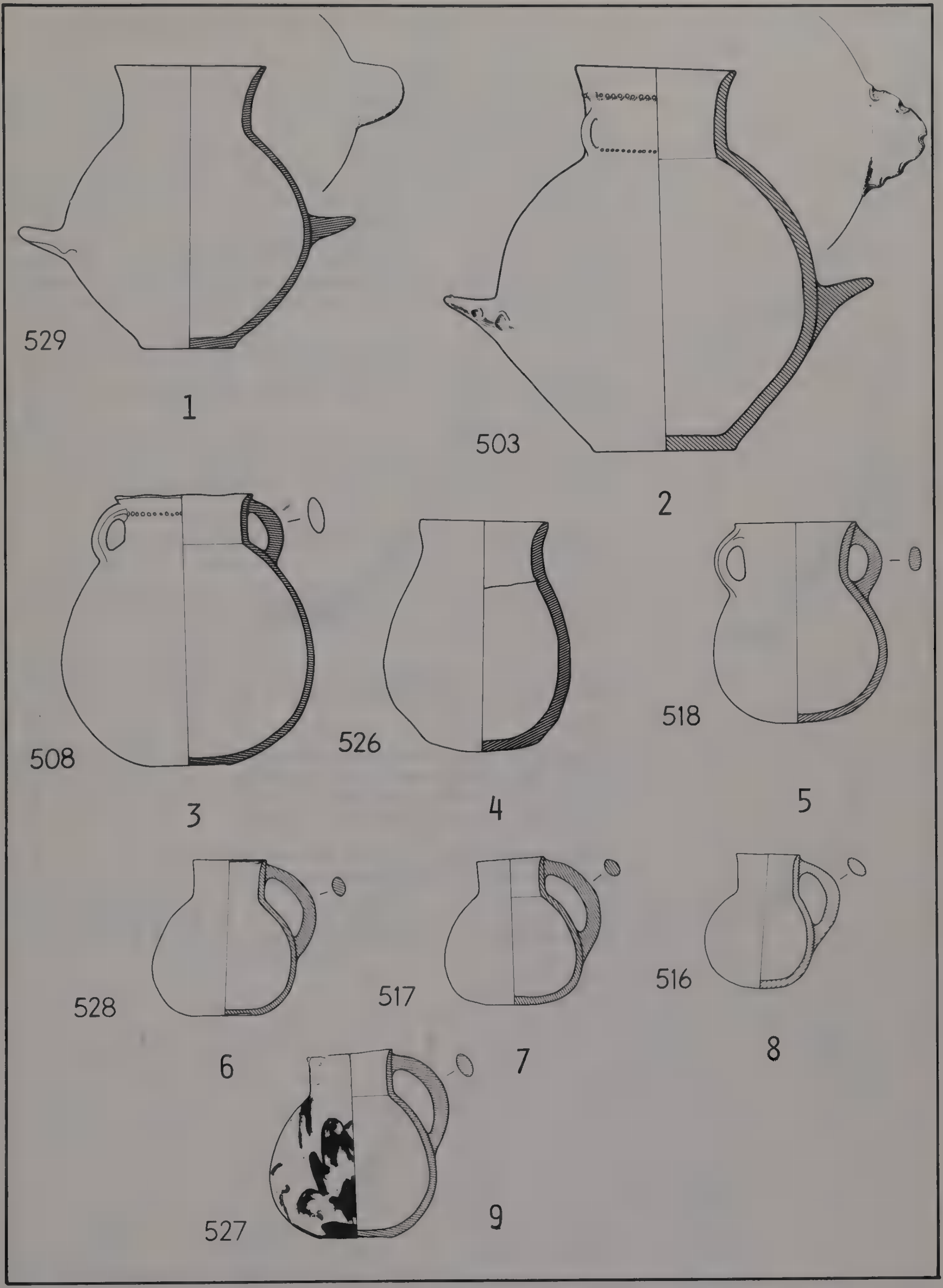


Fig. 2. Tomb A 78 SW

No.	Pot No.	Reg. No.	Ware Description
1	12	509	light reddish brown ware (2.5 YR 6/4) with reddish yellow interior surface color (5 YR 7/6) and very pale brown exterior surface color (10 YR 7/3); some medium and large white inclusions; light gray patching; chipped rim; many finger grooves on interior and exterior body and finger prints on exterior base.
2	21	511	reddish yellow ware (5 YR 7/6) with highly burnished red slip (2.5 YR 4/6); some medium and large white inclusions; moss green to black patching; 3 rows of raised bumps below exterior rim; complete; uneven surface.
3	16	502	pink ware (5 YR 7/4) with light red slip; many small and a few large black and white inclusions; gray patching; line of incised holes and 5 raised knobs below exterior rim with 3 groups of 3 vertical rows of small circular incised holes just below; chipped rim.
4	20	505	orange ware ("pink" 5 YR 7/4) with highly burnished red slip (2.5 YR 4/6); some large white inclusions; black patching; 3 rows of raised bumps below exterior rim; chipped rim; uneven surface.
5	1	504	pink ware (7.5 YR 7/4) with surface color from white ("pink" 7.5 YR 8/4) to pink (5 YR 7/4); many medium black and white inclusions; line of incised holes below exterior rim; striation marks on exterior rim; chipped rim; finger grooves on interior body.
6	4	719	surface color from pinkish white (5 YR 8/2) to light red (2.5 YR 6/6); few large black inclusions; gray patching; line of incised holes below exterior rim; complete.
7	3	512	pink ware (5 YR 7/4) with light red slip (2.5 YR 6/6); some medium black and white inclusions; gray patching; line of incised holes and 6 small raised knobs below exterior rim; slightly chipped rim; circular depression in base.
8	14	514	pink ware (5 YR 8/3 with light red slip (10 R 6/6); some small white inclusions; line of square incised holes below exterior rim; chip in rim; circular depression in base.
9	19	522	yellow (7.5 YR 7/4) with surface color from reddish yellow (7.5 YR 7/6) to light red (2.5 YR 6/6); few large black, brown and white inclusions and some small black inclusions; gray patching; tool markings and traces of red slip (2.5 YR 5/6) (fingerprints?) on exterior; chipped rim; ring base.
10	8	524	light reddish brown ware (5 YR 6/4) with pinkish white surface color (5 YR 8/2); many small black inclusions; chipped rim.
11	18	513	orange ware (5 YR 7/4) with light red slip (2.5 YR 6/6); many medium white inclusions; chipped rim; incomplete circular depressed ring in base.
Not Drawn	6	500	juglet.

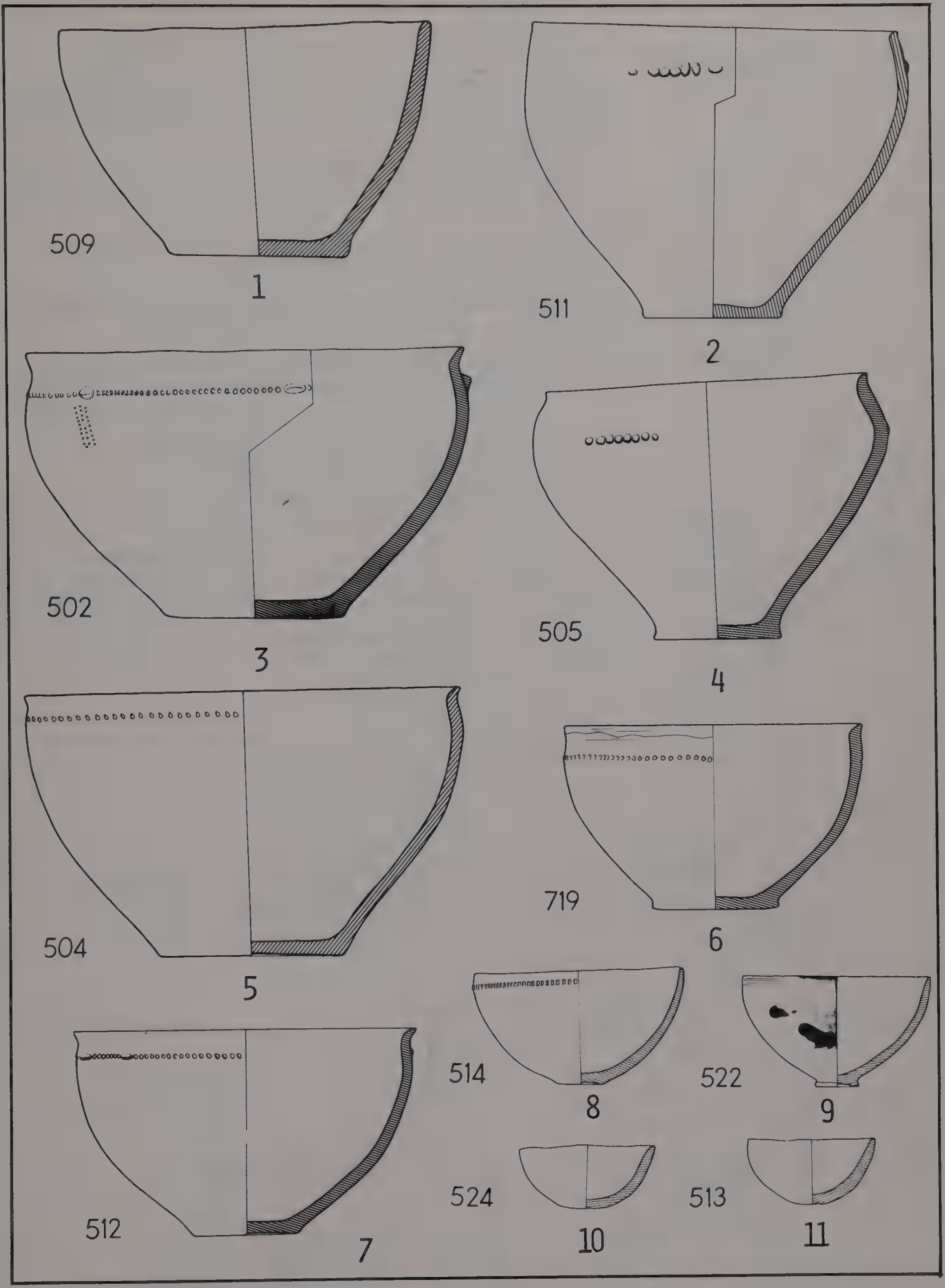


Fig. 3. Tomb A 78 NW

No.	Pot No.	Reg. No.	Ware Description
1	11	473	pink ware (5 YR 7/3) with light red exterior slip (2.5 YR 6/6) carefully dripped from rim into interior neck; line of incised holes and 4 small loop handles at neck; complete; joined neck.
2	14	523	pink ware (7.5 YR 7/4); reddish brown exterior slip (2.5 YR 5/4) and into interior rim with continuous burnish; some small white inclusions; light gray patching; complete; joined neck.
3	15	531	pink ware (5 YR 7/4) with light red exterior slip (2.5 YR 6/6) and slightly into rim; chipped rim; joined neck; circular depression in base.
4	5	525	yellow ware ("pink" 7.5 YR 7/4) with light reddish brown slip (5 YR 6/4); few small black and white inclusions; gray patching; complete; joined neck.
5	6	478	reddish yellow ware (7.5 YR 6/6) with light red exterior slip (2.5 YR 6/6) and slightly into rim; some small white inclusions; complete except that slip is rotted; joined neck.
6	8	520	pink ware (7.5 YR 7/4) with red exterior slip (2.5 YR 5/6) and slightly into interior rim; chip in rim; joined neck; circular depression in base.
7	10	515	pink ware (7.5 YR 7/3) with red exterior splotched wash (2.5 YR 5/6); some small white inclusions; chipped rim; joined neck; depresed ring in base.
8	17	475	tan ware ("pink" 7.5 YR 7/4); red slip (2.5 YR 5/6) with continuous burnish; many small black and some medium white inclusions; gray to black patching; raised slashed band [below exterior rim] and 4 small raised knobs; chip in rim; slip rotted.
9	21	476	pinkish white ware (5 YR 8/2) with red slip (2.5 YR 5/6); few small white inclusions; gray patching; raised band with sharp even slashes and 4 raised knobs with vertical punctures below exterior rim; complete.
10	9	459	pink ware (7.5 YR 7/4); red slip (2.5 YR 5/6) with continuous burnish; some medium black and white inclusions; black patching; line of square incised holes and 4 small raised knobs below exterior rim.
11	16	510	pinkish white ware (5 YR 8/2); red slip (2.5 YR 5/6) with continuous burnish; many small white inclusions; gray patching; raised slashed band and 4 pairs of raised knobs below exterior rim; complete.
12	20	471	tan surface color ("pink" 7.5 YR 7/4) with red slip (2.5 YR 5/6); some medium white inclusions; gray to black patching; line of carefully incised circular holes and 4 small raised knobs with vertical punctures below exterior rim; exterior surface pock marked.

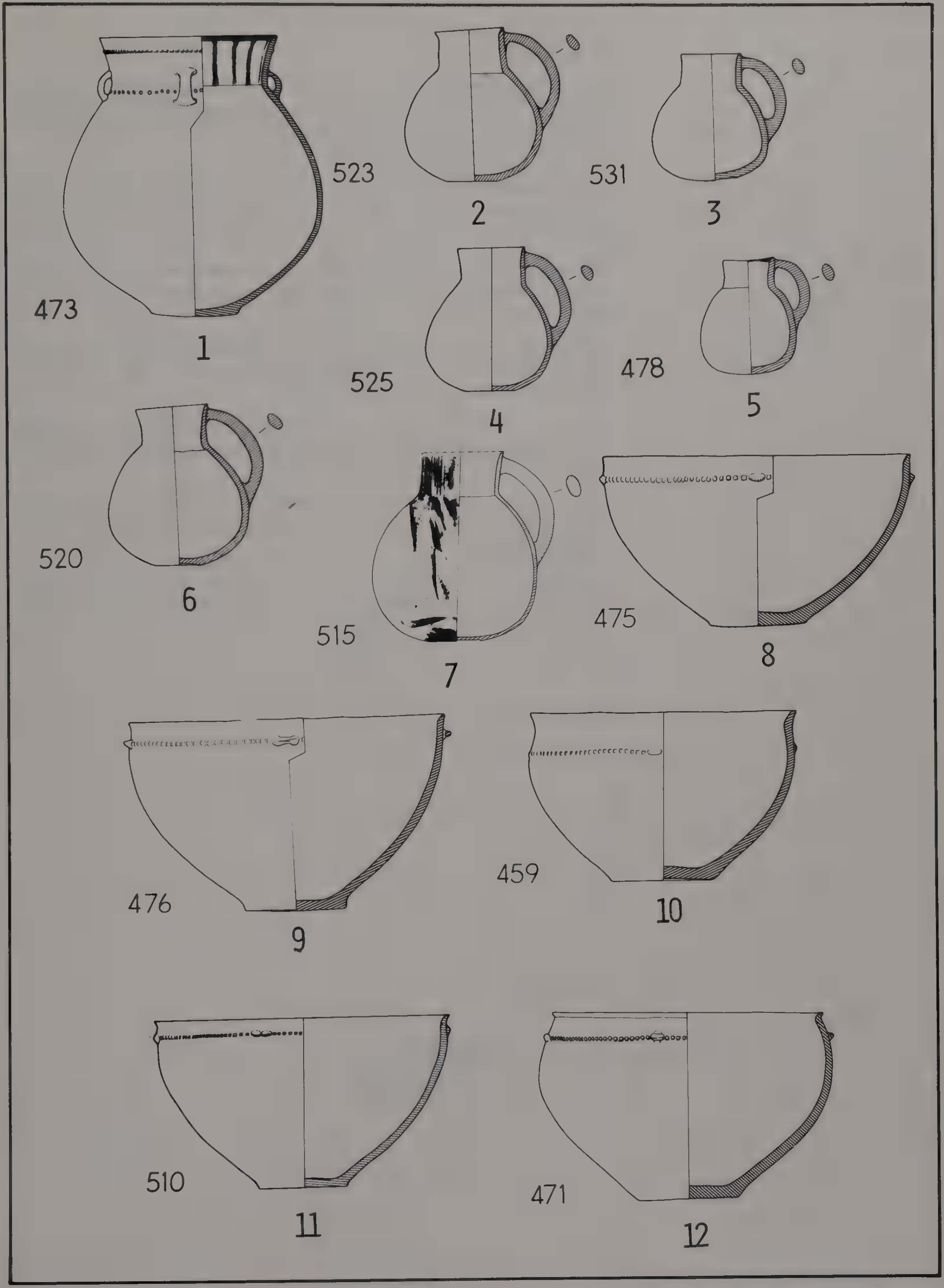
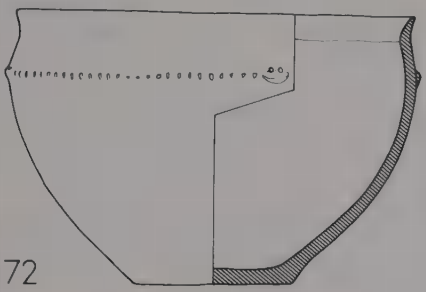


Fig. 4. Tomb A 78 NW

No.	Pot No.	Reg. No.	Ware Description
1	12	472	tan ware ("pink" 7.5 YR 7/4); red slip (2.5 YR 5/6) with continuous burnish on interior; many small white inclusions; moss green to dark gray patching; raised slashed band and 4 raised knobs, each with pair of vertical incisions from top, below exterior rim; complete but with crack in rim.
2	1	507	reddish yellow ware (5 YR 6/6); light red slip (2.5 YR 6/6) with continuous burnish; many small white inclusions; gray to black patching; line of sharp incised holes and 9 raised knobs, with set of vertical slashes in each, below exterior rim; chip in rim.
3	3	506	pink ware (5 YR 7/4) with light red slip (2.5 YR 6/6); many medium black and white inclusions; gray patching; 3 pairs of raised knobs below exterior rim; complete; many finger grooves on interior.
4	2	501	pink ware (5 YR 7/4) with red slip (2.5 YR 5/6); many small and some large white inclusions; gray patching; line of incised holes and 3 raised knobs below exterior rim; chipped and cracked rim; warped oval rim.
5	4	474	pink ware (5 YR 7/4); red slip (2.5 YR 5/6) with continuous burnish; some small white inclusions; gray patching; raised band with sharp even slashes; chipped rim; ring base.
6	19	521	pink surface color (7.5 YR 7/4) with red slip (2.5 YR 5/6); some medium white inclusions; gray to black patching; line of square incised holes below exterior rim; complete; ring base.
7	13	530	pink surface color (7.5 YR 7/4) with red slip (2.5 YR 5/6); some medium white inclusions; gray to black patching; line of incised holes below exterior rim; chipped rim; ring base.
Not Drawn	7		large jug
Not Drawn	18		medium bowl



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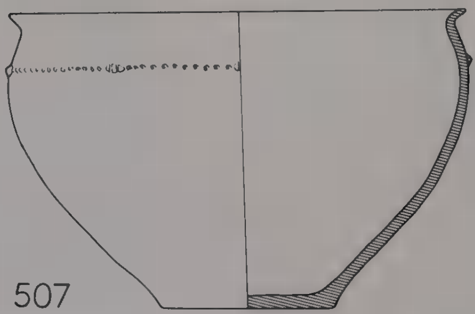

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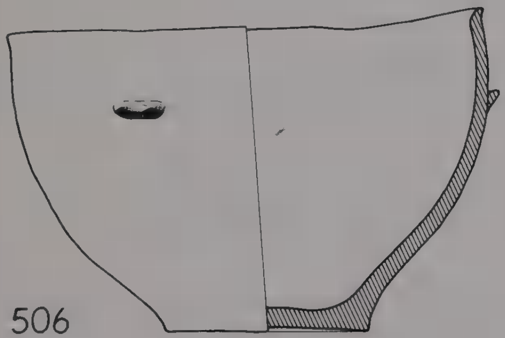

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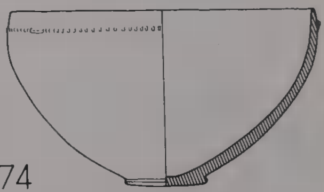

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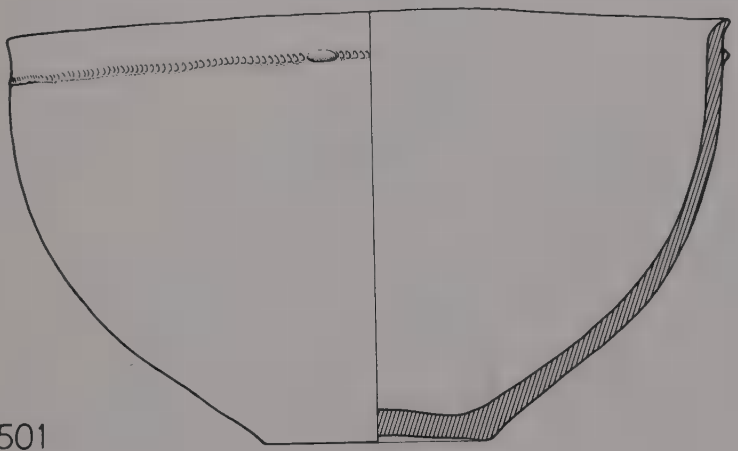

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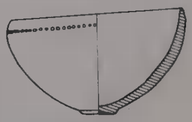

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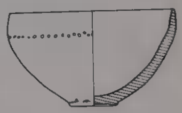

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Fig. 5 Tomb A 100 N

No.	Pot No.	Reg. No.	Ware Description
1	33	688	tan ware ("pink" 7.5 YR 7/4) with surface color from light brown (7.5 YR 6/4) to pinkish white (7.5 YR 8/2); some medium black and white inclusions; gray patching; design like a Roman numeral three incised below exterior neck join line; chipped rim.
2	15	691	pink ware (5 YR 7/4) with surface color from same to lighter (pink 5 YR 7/3); many small and some large white and a few large black inclusions; gray patching; 2 vertical rows of 6 stamped impressions each with 2 half-circle arcs below exterior neck join line; chipped rim.
3	16	673	orange ware ("pink" 5 YR 7/4) with white slip (10 YR 8/2); some medium black and white inclusions; design in upper portion of body impressed with circular stamp divided into 2 equal parts; striation near interior and exterior rim; complete except for rotted slip; residue inside.
4	9	655	reddish yellow ware (5 YR 6/6) with light red slip (10 YR 6/6); many small white inclusions; gray patching; large chips in rim; tool markings on interior near base.
5	7	649	reddish yellow ware (5 YR 6/6) with pink surface (5 YR 7/4); some small black and white and a few large white inclusions; striation marks on exterior of spout; chip in spout.
6	1	1457	tan ware ("pink" 7.5 YR 7/4) with red exterior slip (2.5 YR 5/6) and into interior rim and wall above spout; some small and medium black inclusions; partially repaired bowl with pieces missing from lower body; striation marks on interior and exterior near rim.
7	23	667	pink ware (7.5 YR 7/4) with red exterior slip (10 YR 5/6) and smudged on interior near spout; some medium black and white inclusions; gray patching; complete; uneven surface; tool markings on interior near spout.
8	11	652	reddish yellow ware (5 YR 6/6) with pink surface color (5 YR 7/4); many small and some medium black and white inclusions; complete.

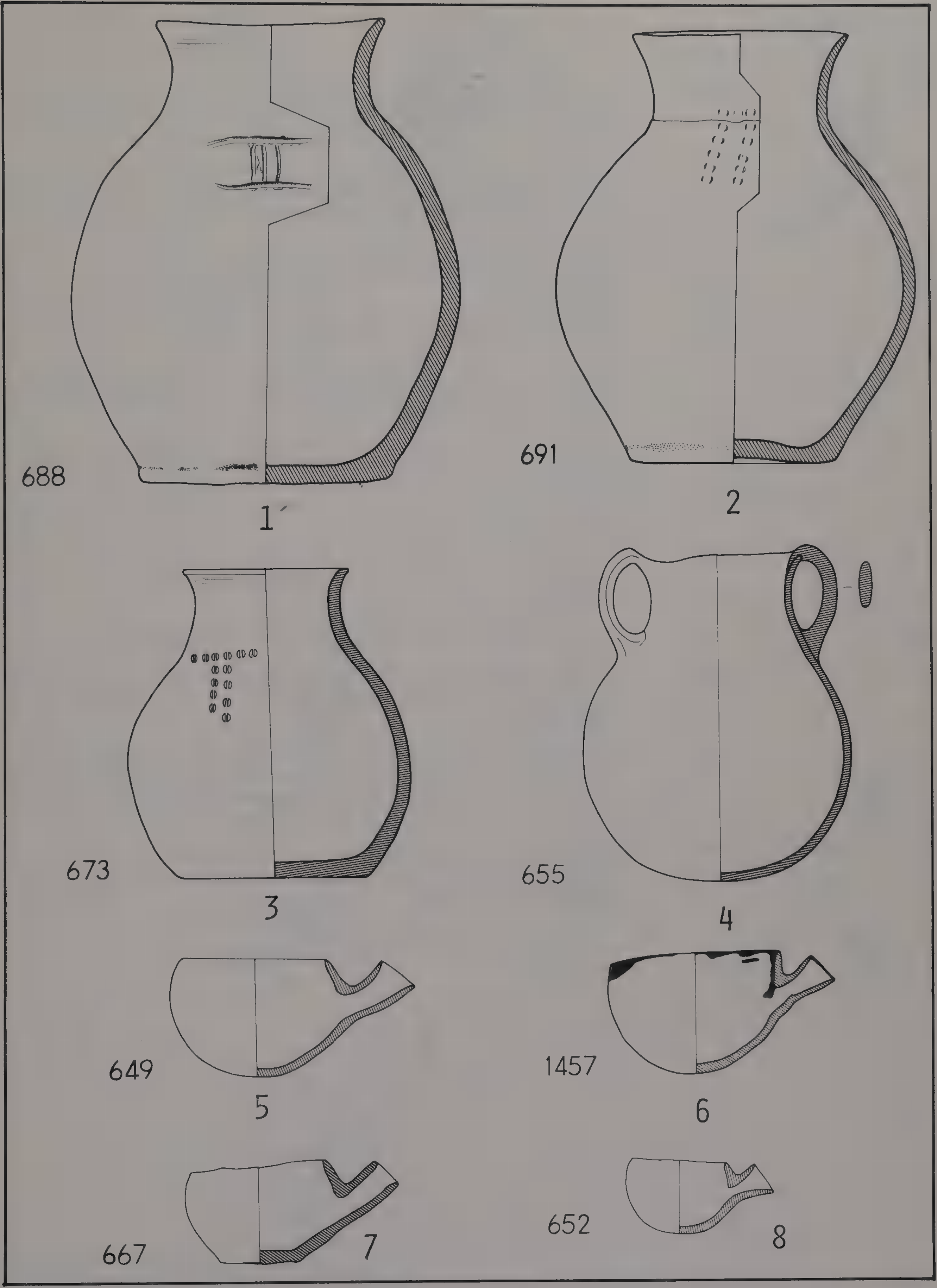


Fig. 6. Tomb A 100 N

No.	Pot No.	Reg. No.	Ware Description
1	2	642	pink ware (5 YR 7/4); red exterior slip (10 YR 4/6) with continuous burnish; some medium and large white inclusions; light moss green patching; chipped rim; crack from rim to base; chip in base; joined neck.
2	3	664	pink ware (5 YR 7/4) with red slip (2.5 YR 5/6) elaborately painted on exterior in pattern of horizontal and tilted vertical lines; slip on interior near rim; some small black and white inclusions; gray patching; complete; joined neck.
3	32	683	pink ware (5 YR 7/4); light red slip (2.5 YR 6/6) with random burnish; few small black and some medium white inclusions; chipped rim; joined neck.
4	26	641	white green surface color ("white" 10 YR 8/2); some medium black inclusions; 5 incised short slashes on interior at juncture of handle and rim; chipped rim.
5	28	657	yellow green surface ("very pale brown" 10 YR 8/4); some medium and a few large white inclusions; 4 incised holes in square pattern on interior neck at juncture of loop handle and rim; complete.
6	13	679	pink ware (5 YR 7/4); some small white and a few medium black and white inclusions; chipped rim.
7	6	658	pink ware (5 YR 7/4) with pink surface color (7.5 YR 7/4); some medium black and white inclusions; slightly chipped rim.
8	18	633	pink surface color (5 YR 7/4); few medium black and white inclusions; complete.
9	24	635	missing
10	14	632	pink surface color (5 YR 7/3); some small white inclusions; complete; (seeds inside).
11	29	647	surface color from yellow ("pink" 7.5 YR 7/4) to pink (5 YR 7/4); few small and large white inclusions; green gray patching; horn at top of loop handle; complete but with crack in rim.
12	30	663	white green surface color ("white" 10 YR 8/2); some small black and white inclusions; striation marks exterior ladle rim; bird (?) design apparently incised with a finger nail covering almost entire exterior surface; group of same sort of incised marks on interior at juncture of handle and rim; complete.
13	27	659	white green surface color ("white" 10 YR 8/2); some small and medium black and white inclusions; horn at top of ladle handle; 6 incised holes on interior at juncture of handle and rim; complete.

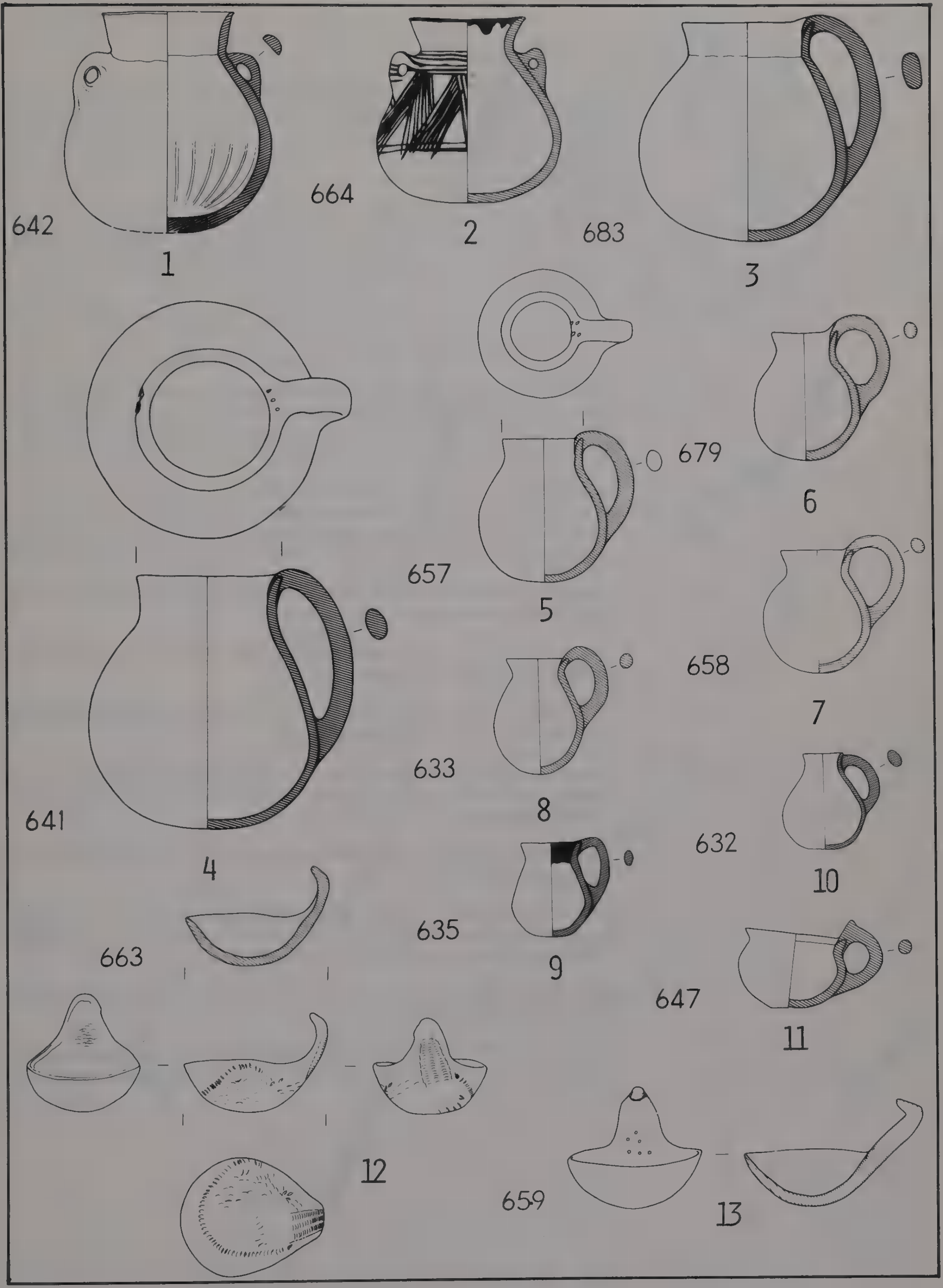
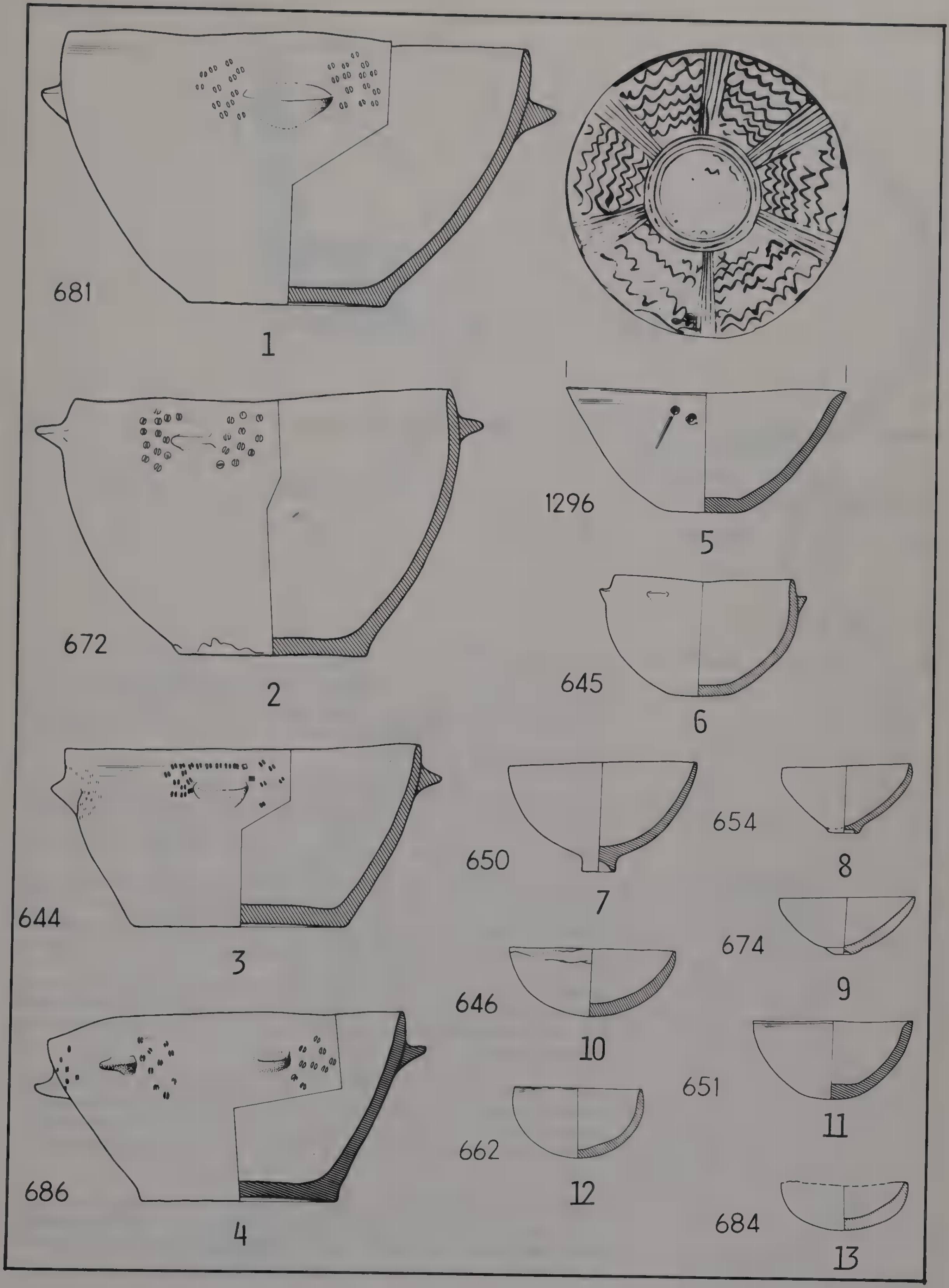


Fig. 7. Tomb A 100 N

No.	Pot No.	Reg. No.	Ware Description
1	5	681	pink ware (5 YR 7/4) with surface color from pinkish white (5 YR 8/2) to pink (5 YR 7/4); many small and some large white inclusions; gray patching; 4 small ledge handles with a group of impressions from circular stamp divided inot 2 equal parts on either side of one handle; chip in rim; striation marks near interior and exterior rim; tool markings on exterior.
2	25	672	surface color from pinkish white (5 YR 8/2) to reddish yellow (5 YR 7/6); some small and medium and a few large white inclusions; gray patching; 6 small ledge handles with a group of impressions from circular stamp divided into 2 equal parts on either side of one handle; complete; tool markings on exterior.
3	21	644	very pale brown surface color (10 YR 8/3); few large black and white inclusions; incised holes next to and above each of 4 ledge handles made with 2-pronged instrument; striation marks near interior and exterior rim; complete.
4	20	686	light red ware (10 YR 6/6) with pinkish white surface color (5 YR 8/2); some small white inclusions; gray patching; striation marks at interior and exterior rim; group of impressions made with a circular stamp divided into 2 equal parts, to the right of 3 consecutive ledge handles; total of 6 ledge handles; complete.
5	12	643 (= 1296 on figure)	light red interior surface color (2.5 YR 6/8) and tan exterior surface color ("pink" 7.5 YR 7/4); red slip (2.5 YR 5/6) elaborately painted on interior in pattern of lines and interlocking zig-zags; some small and medium black and white inclusions; light gray patching; 2 punctures located next to one another near rim; slightly chipped rim.
6	31	645	very pale brown surface color (10 YR 8/3); few medium and large white inclusions; 6 ledge handles below exterior rim; complete.
7	10	650	tan ware ("pink" 7.5 YR 7/4) with red exterior slip (2.5 YR 5/6); some small and medium white inclusions; complete; ring base.
8	4	654	pink ware (5 YR 7/4) with red slip (2.5 YR 5/6); some medium white inclusions; chipped rim; ring base with depressed center.
9	17	674	orange ware ("pink" 5 YR 7/4) with red slip (2.5 YR 5/6); few small black inclusions; chipped rim; circular depression in base; found used as a lid for no. 673, fig. 5:3; residue on exterior.
10	22	646	pink ware (7.5 YR 8/4) with pink surface color (5 YR 7/4); many medium black and white inclusions; chipped rim.
11	8	651	yellow ("reddish yellow" 7.5 YR 7/6) to orange ("reddish yellow" 5 YR 7/6) surface color; reddish brown slip (2.5 YR 5/4) mostly on interior; some medium white inclusions; striations near exterior rim; complete.
12	19	662	pink ware (5 YR 7/4); red slip (2.5 YR 5/6) with continuous burnish; some small black inclusions; chip in rim.
13	34	684	pinkish white ware (7.5 YR 8/2) charred around entire rim; some large and many small white inclusions; chipped rim; poorly made with roughly formed rim.



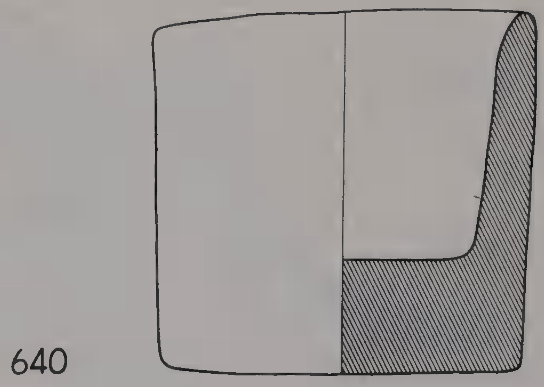
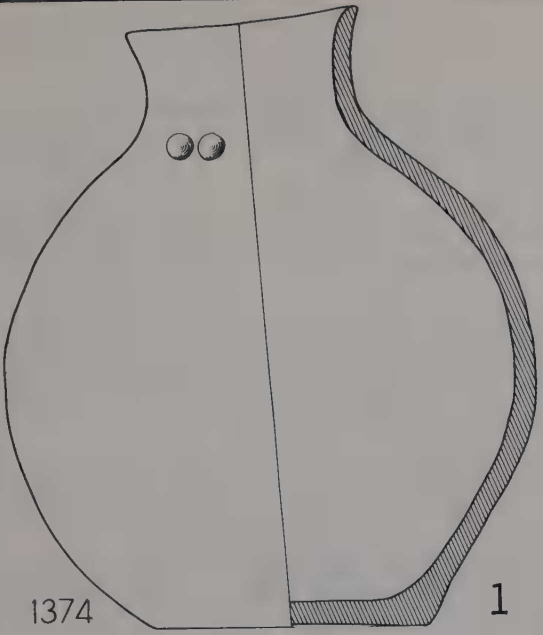


Fig. 8. Tomb A 100 N

No.	Pot No.	Reg. No.	Ware Description
1		640	basalt bowl.

Fig. 9. Tomb A 88 L

No.	Pot No.	Reg. No.	Ware Description
1	35	1374	light red ware (2.5 YR 6/8) with pink (7.5 YR 8/4) surface color with one dark grey patch; small to medium black and white inclusions (0.2 mm-2.0 mm); one pair of small raised dots at base of neck; 3 small and 1 large rim chips; fairly well made, but stance of neck slightly askew.
2	1	1312	orange tan ware (reddish yellow 5 YR 7/6) with pink (7.5 YR 7/4) surface color; many small black and white inclusions (0.2 mm-0.5 mm) with few large inclusions (up to 3.5 mm); raised knob at base of neck on inside; rim and completely missing except at one small point; fairly crudely made, with signs of smoothing.
3	7	1323	orange tan ware (light red 2.5 YR 6/6) with reddish yellow (5 YR 7/6) color; traces of red slip (2.5 YR 4/8) from rim to base; small to medium black and mostly white inclusions (0.2 mm-3.5 mm); round puncture marks all around neck base; two small duck-bill type ledge handles; few small rim chips; joined neck; fairly coarse ware.
4	42	1224	brownish tan ware (reddish yellow 5 YR 6/6) with reddish yellow (5 YR 7/6) surface color with light grey patching; red (10 R 4/8) slip; small to large black and white and red inclusions (0.2 mm-5.0 mm); few chips on rim and spout; complete; well made; symmetrical.
5	60	1288	brown tan ware (light brown 7.5 YR 6/4) with reddish yellow (5 YR 7/6) surface color with weak red (7.5 YR 4/4) slip; many small to medium black and white inclusions (0.2 mm-3.0 mm); round puncture holes around base of neck; rim badly chipped; large chip on one handle; fairly crudely made; strap handles joined at rim.
6	51	1375	reddish brown ware (2.5 YR 5/4); light red (2.5 YR 6/8) surface color with some yellow patching and red (10 R 4/8) slip which is complete; many small black and white, mostly white inclusions (0.2 mm-0.5 mm); round puncture holes around neck base; complete; one handle broken and mended; fairly crudely made; strap handles.



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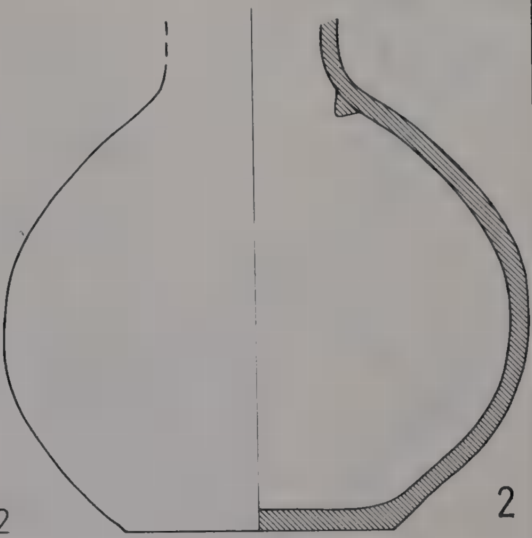

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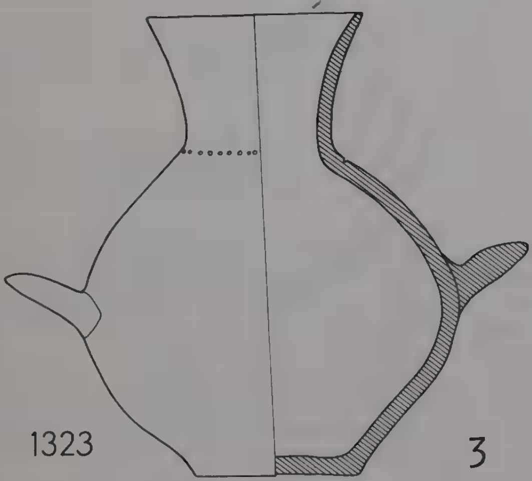

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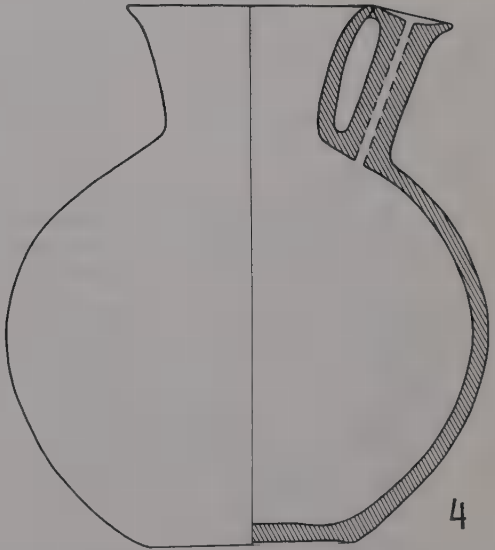

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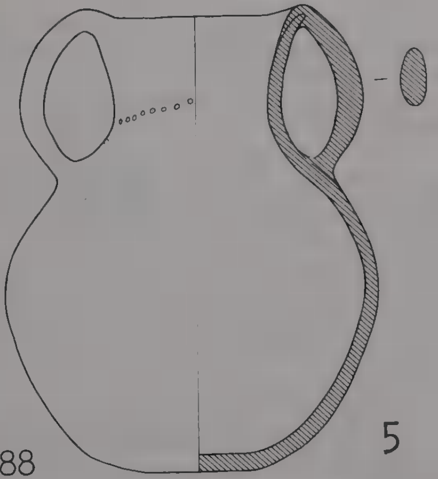

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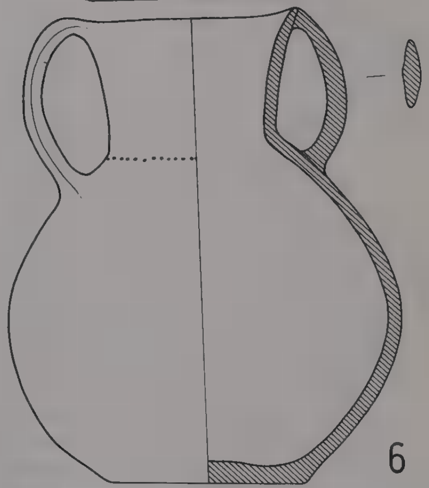

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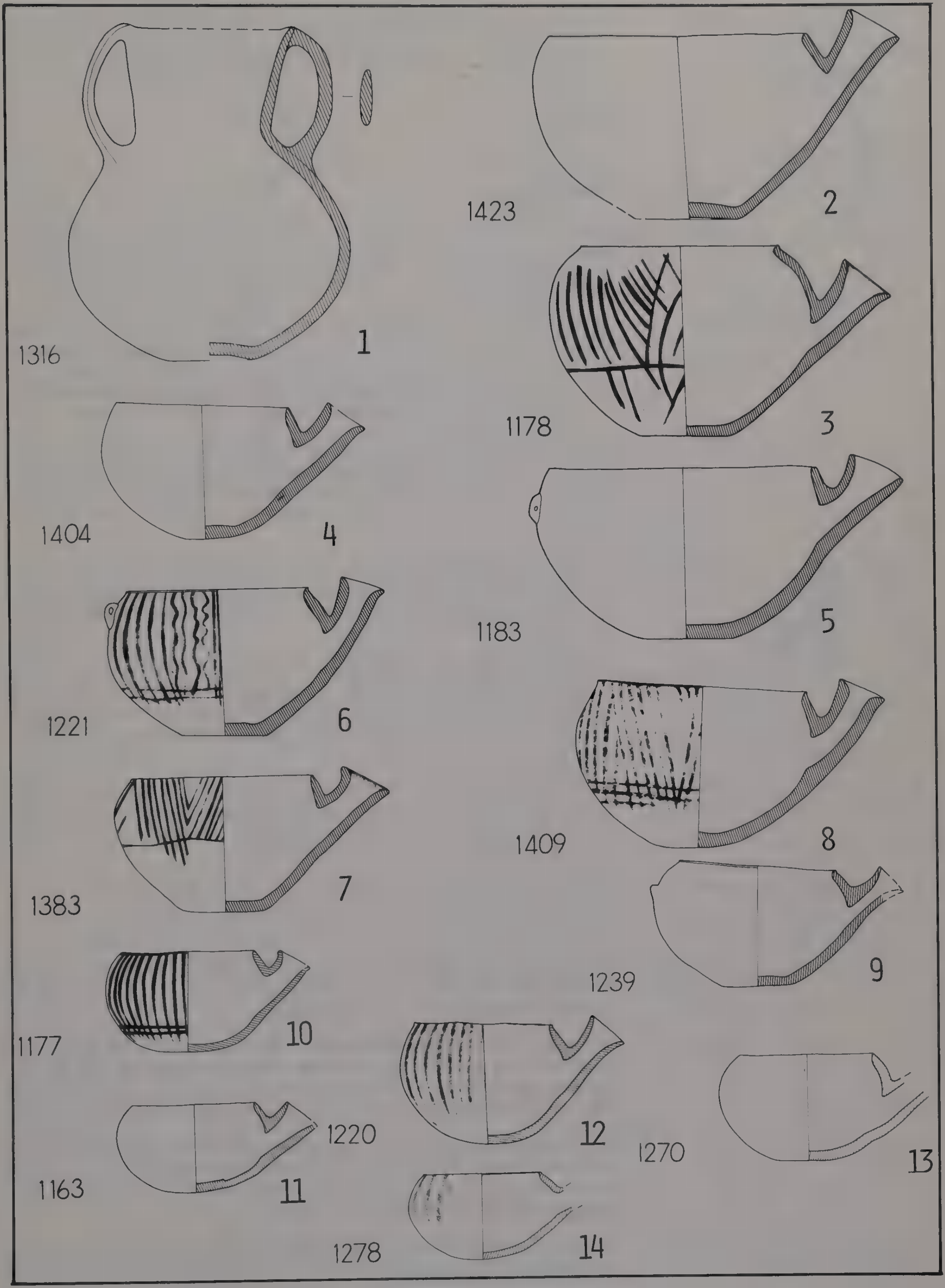
Fig. 10. Tomb A 88 L

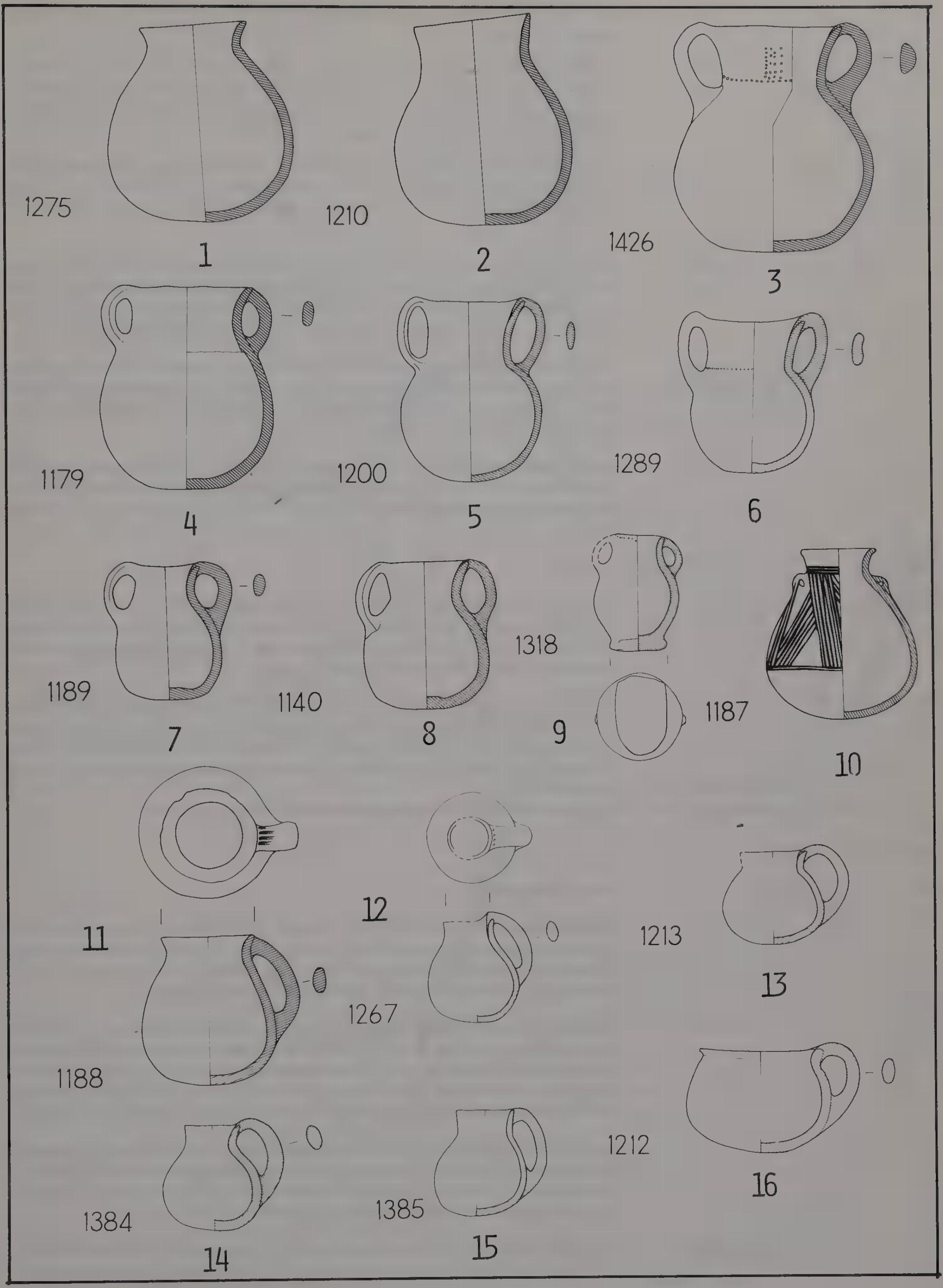
No.	Pot No.	Reg. No.	Ware Description
1	73	1316	brownish tan ware (pink 5 YR 7/3) with pink (5 YR 7/4) surface color; weak red slip (7.5 R 4/4); few small black and white inclusions (0.2 mm-2.0 mm); rim badly chipped; well made; joined strap handles.
2	68	1423	chips insufficient to tell ware color; reddish yellow (5 YR 7/6) surface color with red (7.5 R 5/6) slip; small black and white inclusions (0.2 mm-1.5 mm); traces of red (7.5 R 5/6) band around spout rim; small rim chips; rough surface; heavy incrustation.
3	5	1178	orange tan to brown ware (reddish yellow 5 YR 6/6) with reddish yellow (5 YR 7/8) surface color; small to medium black and white inclusions (0.2 mm-2.5 mm); some cross hatching; few tiny rim chips and 4 fairly large chips on spout rim; fairly well made, with crude flattened base; fairly heavy incrustation.
4	12	1404	orange tan ware (light red 2.5 YR 6/8) with pink (7.5 YR 7/4) surface color; very few small black and white inclusions (0.2 mm-0.5 mm); 10 small rim chips; very heavy incrustation; fairly well made; flattened but slightly round base.
5	11	1183	brown tan ware (light reddish brown 2.5 YR 6/4); surface color is reddish yellow (5 YR 7/6) with weak red (7.5 R 5/4) slip; many small black and white inclusions (0.2 mm-1.0 mm) with a few larger ones (up to 3.0 mm); small vertical lug handle; whole; small rim chips; fairly well made.
6	41	1221	orange tan ware (light red 2.5 YR 6/6) with reddish yellow (5 YR 7/6) surface color; small red, black and white inclusions (0.2 mm-1.0 mm); vertical lug handle opposite spout; few tiny rim chips; fairly well made.
7	77	1383	orange tan ware (reddish yellow 5 YR 6/6) with reddish yellow (5 YR 7/8) surface color; small black and white inclusions (0.2 mm-1.0 mm); several small rim chips; fairly crudely made.
8	86	1409	light red ware (2.5 YR 6/8) with light red (2.5 YR 6/8) surface color; many small to medium black and mostly white inclusions (0.5 mm-2.5 mm); vertical lines from rim 3/4 way down with two roughly parallel lines circling pot; 2 small rim chips, few small spout rim chips; fairly well made, but many large inclusions.
9	92	1239	light red ware (red 10 R 5/8); surface color is light red (10 R 6/8) with some yellow patching; few black and white inclusions (0.2 mm-1.0 mm); slight groove along rim; small knob outside below rim; many small rim chips; half of spout rim is badly chipped; fairly nicely made; signs of smoothing.
10	22	1177	orange tan ware (pink 5 YR 7/4) with pink (5 YR 8/3) surface color; many small white and mostly black inclusions (0.2 mm-1.5 mm); narrow red band on outside of rim with horizontal red paint bands from rim to base; 2 parallel red lines circle pot; 1 large rim chip and 10 small ones; half of spout rim is missing; fairly well made; few large pock-marks from inclusions.
11	64	1163	tannish brown ware (light reddish brown 2.5 YR 6/4) with light red (2.5 YR 6/8) surface color with white to grey patches; small to medium black and white inclusions (0.2 mm-2.0 mm); 2 large and many small rim chips; crudely made.
12	31	1220	orange tan ware (reddish yellow 5 YR 7/9) with same surface color; small black and white inclusions (0.2 mm-0.5 mm); vertical red lines running from rim to middle of outside of pot faintly visible; few tiny rim chips; fairly well made; a number of straw impressions on surface of pot.
13	58	1270	light red ware (red 10 R 5/8) with light red (10 R 6/8) surface color; many small-medium black and white inclusions (0.2 mm-3.0 mm); faint traces on shoulder of red vertical paint lines; many small rim chips; rim and upper half of spout missing; fairly heavily incrusted; crudely made.



14	43	1278	orange tan ware (reddish yellow 5 YR 7/6) with light red (2.5 YR 6/8) surface color; many small white inclusions (0.2 mm-0.5 mm); vertical red and a few squiggled bands running from rim and converging at base; many rim chips; fairly well made.

Fig. 11. Tomb A 88 L

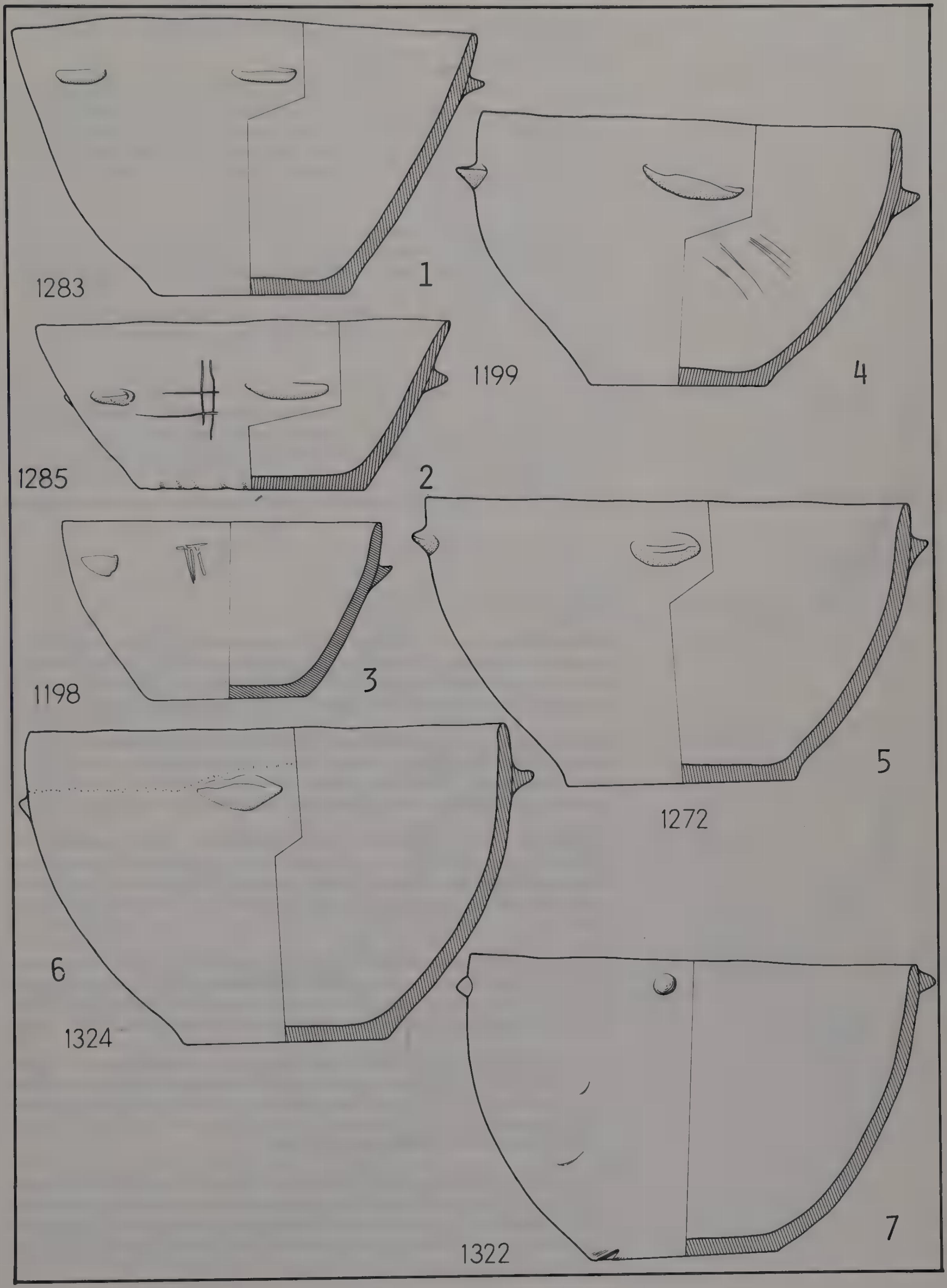
No.	Pot No.	Reg. No.	Ware Description
1	36	1275	chips not sufficient to determine color; reddish yellow (5 YR 7/6) surface color with black patching and red (2.5 YR 5/8) slip; random and horizontal burnishing; small to medium black and mostly white inclusions (0.5 mm-4.0 mm); few small rim chips; very symmetrical; surface is rough.
2	30	1210	brown ware (reddish brown 2.5 YR 5/4) with reddish yellow (5 YR 7/6) surface color; many small black and white and a few large inclusions (0.2 mm-1.0 mm), 4.0 color; many small black and white and a few large inclusions (0.2 mm-1.0 mm, 4.0 mm); one large and a few small rim chips; pock-marks from inclusions; some scaling; coiling visible on inside, fairly crudely made; surface is rough.
3	23	1426	red ware (10 R 5/8) withlight red (10 R 6/6) surface color; many tiny white inclusions (0.2 mm-0.5 mm); eliptical puncture holes on neck base; 1 large and 5 small rim chips; badly broken but mended; crudely made; appears to have been smoothed with cloth, cloth impressions around base of pot; few pock-marks from inclusions.
4	13	1179	orange tan ware (light red 2.5 YR 6/8) with pink (5 YR 8/4) surface color with yellow patching; many small black and white inclusions (0.2 mm-1.0 mm); 4 large and several small rim chips; complete; rough surface; joined strap handles; many tiny pock-marks from inclusions.
5	15	1200	brownish tan ware (light reddish brown 5 YR 6/4); pink (5 YR 7/4) surface color with red (10 R 5/6) slip; many small to large black and white inclusions (0.2 mm-4.0 with red (10 R 5/6) slip; many small to large black and white inclusions (0.2 mm-4.0 mm); 1 small and a few tiny rim chips; complete; well made; symmetrical; strap handles.
6	29	1289	brownish tan ware (pink 7.5 YR 7/4); same surface color with weak red (7.5 R 4/4) slip; small to large black and white inclusions (0.2 mm-4.0 mm); puncture design around base of neck; broken pot mended; 3 rim chips and 1 chip on handle; complete; crudely made; neck attached separately.
7	44	1189	orange tan ware (light red 2.5 YR 6/8) with white (10 YR 8/2) surface color; small to large black and white inclusions (0.2 mm-3.0 mm); some incrustation; complete; crudely made; strap handles.
8	33	1190 (= 1140 on figure)	brown tan ware (pink 5 YR 7/4) with pink (7.5 YR 7/4) surface color; many small to medium black and white inclusions (0.5 mm-3.0 mm); few tiny rim chips; whole; handles attached by folding over; crudely made.
9	59	1318	brownish tan ware (light reddish brown 5 YR 6/4) with pink (5 YR 7/4) surface color; many very small black and white and a few larger inclusions (0.2 mm-0.5 mm, 1.5 mm); round puncture marks all around rim; large rim chip, many small chips on rim; joined handle; flat, elliptical base, crudely made; base appears to be oversized.
10	16	1187	orange tan ware (reddish yellow 5 YR 7/6) with same surface color; small black and white inclusions (0.2 mm-1.5 mm); series of parallel red bands forming triangle from base to base of neck, with 2 parallel lines circling above base; some incrustration; chips around half of rim; symmetrical shape, nicely made.
11	54	1188	brown ware (reddish yellow 5 YR 6/6); light red (2.5 YR 6/8) surface color with one large light grey patch; small to large black and white inclusions (0.2 mm-4.0 mm); 4



			vertical lines on handle near rim; few small rim chips; crudely made; roughly smoothed surface.
12	94	1267	brown tan ware (pink 7.5 YR 7/4) with same surface color; many small to medium black and white inclusions (0.2 mm-3.0 mm); 4 round puncture marks on handle at point of attachment; chipped rim; many pock-marks from inclusions; handle attached at rim, with no evidence of folding over; fairly crudely made.
13	87	1213	light red ware (10 R 6/8); same surface color with yellow patching and weak red (7.5 R 4/4) slip; small to medium black and white inclusions (0.2 mm-3.5 mm); 2 large rim chips, small rim chips; flaking surface; neck made separately; handle folds over rim.
14	78	1384	orange tan ware (reddish yellow 5 YR 7/6); reddish yellow (5 YR 7/8) surface color with light red patching and red (10 R 4/6) slip; many small black and white and a few large white inclusions (0.2 mm-1.0 mm, 4.0 mm); complete but with 3 large rim chips; handle attached by folding over; some straw impressions; crudely made.
15	79	1385	orange tan ware (reddish yellow 5 YR 7/6) with reddish yellow (5 YR) surface color; few very small black and white inclusions (0.2 mm-0.5 mm); complete; handle folded over; impressions of coarse cloth used for smoothing; fairly well made; light grey incrustation covers most of surface.
16	10	1212	brown ware (yellowish red 5 YR 5/6); reddish yellow (5 YR 7/6) surface color with reddish patching; few small black and white inclusions (0.2 mm-0.5 mm); large rim chip missing; some smaller rim chips; fairly well made; handle attached by folding over.
Not Drawn	72	1202	missing
Not Drawn	18	1176	orange tan ware (light red 2.5 YR 6/6); reddish yellow (5 YR 7/6) surface color with light yellow patching and light red (2.5 YR 6/6) slip; small black and white inclusions (0.2 mm-0.5 mm); 1 small rim chip; slight scaling of outer surface; neck and handle attachment clearly visible; fairly crudely made.
Not Drawn	69	1378	brown tan ware (reddish yellow 5 YR 6/6); pink (5 YR 7/3) surface color with red (7.5 R 5/8) slip; few small black and mostly white inclusions (0.2 mm-0.5 mm); raised slashed band on top of handle; 2 large rim chips; 5 smaller chips; large body sherds missing; 5 large body sherds mended; thin ware; small pock-marks from inclusions; well made.

Fig. 12. Tomb A 88 L

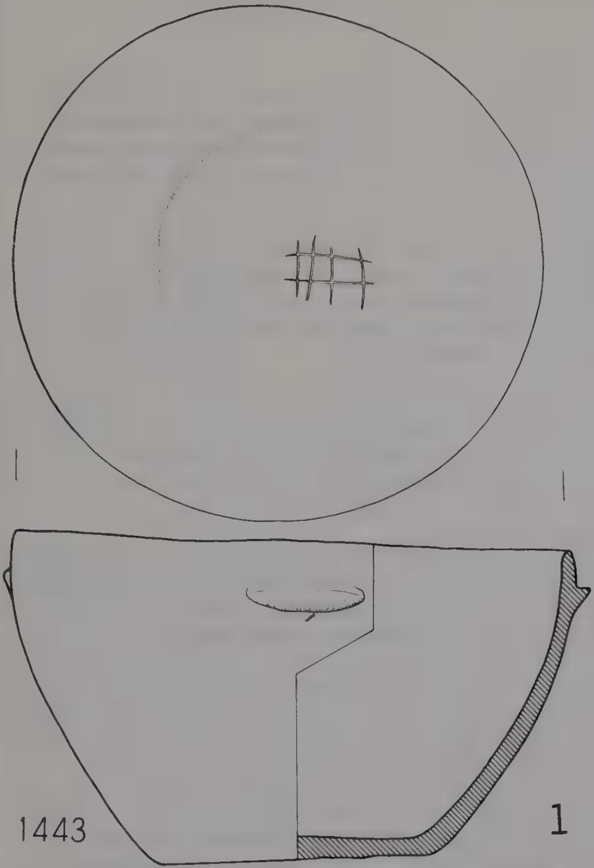
No.	Pot No.	Reg. No.	Ware Description
1	55	1283	reddish brown ware (red 2.5 YR 5/6) with light red (2.5 YR 6/8) surface color; small to large black and white inclusions (0.2 mm-4.0 mm); 5 ledge handles evenly spaced; 1 large and several smaller rim chips; slight peeling of inside surface; straw impressions on surface; handles crudely and poorly attached.
2	2	1285	tannish brown ware (light brown 7.5 YR 6/4); reddish yellow (5 YR 7/6) surface color with grey patching; small to medium black and white inclusions (0.5 mm-3.0 color with grey patching; small to medium black and white inclusions (0.5 mm-3.0 mm); 5 crude, small ledge handles; incised decoration; many small rim chips; surface very rough; horizontal smoothing marks; many thumb prints on base.
3	8	1198	brownish tan ware (pink 5 YR 7/3) with pink (5 YR 8/4) surface color; many small black and white inclusions (0.2 mm-1.0 mm); 3 small ledge handles evenly spaced; 3 vertical incised lines and 1 horizontal line; 15 small rim chips and 1 large crack; signs of coiling on inside; ledge handles poorly attached; base is crude.
4	9	1199	light red ware (2.5 YR 6/6) with same surface color and yellow and grey patching; small to large black, white and red inclusions (0.2 mm-4.0 mm); 4 crudely made small



			ledge handles; 4 large and few small rim chips; ledge handles slightly chipped; random grooves from some smoothing instrument visible on inside; few pock-marks and straw impressions inside and out.
5	26	1272	tan brown ware (light brown 7.5 YR 6/4); light red (2.5 YR 6/6) surface color with white to light grey patching; small to large black and white inclusions (0.2 mm-5.0 white to light gray patching; small to large black and white inclusions (0.2 mm-5.0 mm); 4 roughly evenly spaced small ledge handles; few small rim chips; rim slightly oblong; handles crudely attached; evidence of folding around base attachment.
6	14	1324	orange tan ware (reddish yellow 5 YR 6/6); light red (2.5 YR 6/6) surface color with white to yellow patching; many small to large black and white inclusions (0.5 mm-5.0 white to yellow patching; many small to large black and white inclusions (0.5 mm-5.0 mm); 4 roughly evenly spaced small ledge handles; small round puncture holes; one crack from rim halfway down; several tiny rim chips, chips on handles; some scaling; pock-marked from inclusions; fingermarks from smoothing; fairly well made.
7	10	1322	orange tan ware (light red 2.5 YR 6/6); reddish yellow (5 YR 7/6) surface color with yellow to dark grey patching; many small black and white and few larger, mostly white inclusions (0.2 mm-1.0 mm, 6.0 mm); 4 small knobs evenly spaced below rim; one large, many small rim chips; 4 large rim chips mended; knobs crudely attached; stance askew.

Fig. 13. Tomb A 88 L

No.	Pot No.	Reg. No.	Ware Description
1	63	1443	brownish tan ware (reddish yellow 5 YR 6/6) with same surface color; many small to large black, white and red inclusions (0.5 mm-4.0 mm); 4 evenly spaced small ledge handles; incised design on inside base; many pock-marks from inclusions; 5 large and few other rim chips; clear signs of smoothing; ledge handles crudely attached.
2	39	1387	light red ware (2.5 YR 6/6) with same surface color; many small and very few large black and white inclusions (0.2 mm-0.5 mm); 4 small ledge handles evenly spaced below rim; incised "X" on base inside; many small rim chips; 5 large broken (mended) pieces; white to grey incrustations; finger marks from smoothing; crude.
3	3	1246	brownish tan ware (reddish yellow 5 YR 6/6); light red (2.5 YR 6/8) surface color with some yellow patching; many small black and white inclusions (0.2 mm-1.0 mm, few up to 3.0 mm); 4 evenly spaced knobs below rim; 1 large rim chip; several small chips; some flaking on surface; signs of coiling near base inside and out; crudely made.
4	40	1308	brownish tan ware (light brown 7.5 YR 6/4) with light red (2.5 YR 6/6) surface color with some yellow patching; many small black and white, and a few larger inclusions (0.2 mm-1.0 mm, 4.0 mm); 4 roughly evenly spaced small ledge handles; 2 large and a few small rim chips; evidence of coiling; some incrustation; crudely made.
5	48	1286	tannish brown ware (light reddish brown 2.5 YR 6/4); reddish yellow (5 YR 7/6) surface color with white to grey patching; small black and white inclusions (0.2 mm-1.0 mm); incised design: vertical lines made first, then horizontal; 4 small ledge handles spaced equidistantly; 2 large rim chips and many small ones; traces of coiling inside; evidence of smoothing inside and out.
6	25	1174	orange tan ware (reddish yellow 5 YR 6/6) with reddish yellow (5 YR 6/8) surface color; small to large white and black inclusions (0.2 mm-0.4 mm); incised marks below rim on inside; 4 small ledge handles spaced equidistantly near rim; 2 large rim chips and a few small ones; evidence of coiling visible inside and out; impresions of smoothing; surface rough; rim is elliptical.



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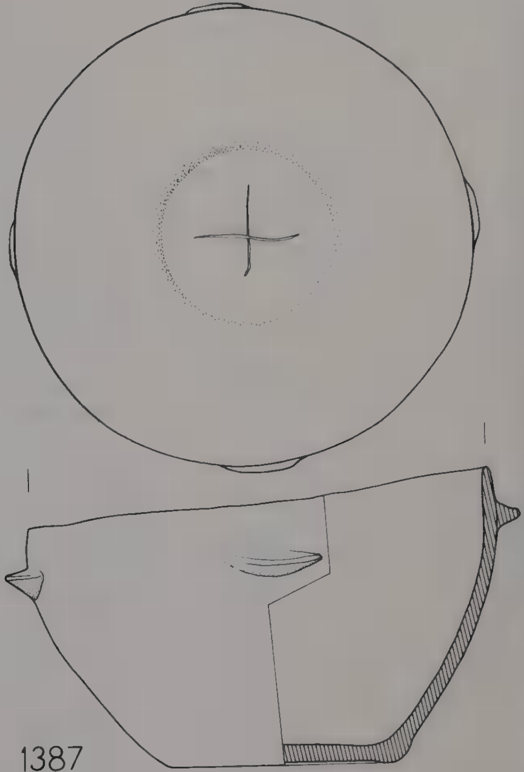

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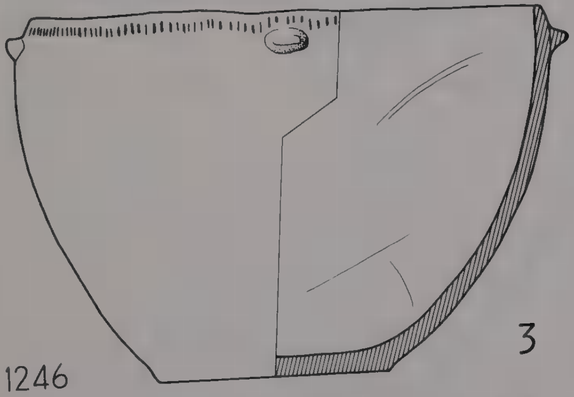

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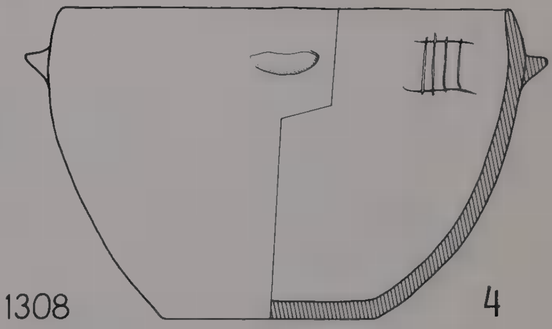

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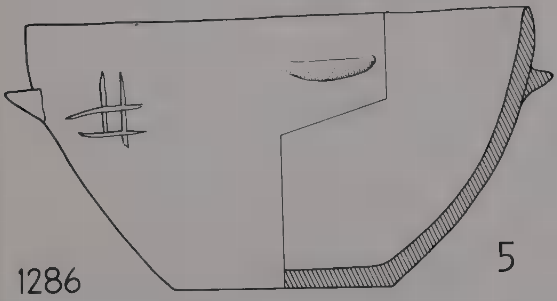

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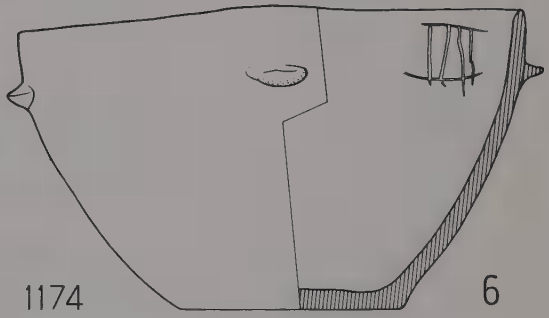

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Fig. 14. Tomb A 88 L

No.	Pot No.	Reg. No.	Ware Description
1	74	1329	orange tan ware (light red 2.5 YR 6/6); reddish yellow (5 YR 6/8) with yellow and dark grey patching; many small to medium black and white inclusions with a few larger ones (0.2 mm-3.0 mm, 8.0 mm); 4 small ledge handles evenly spaced below rim; incised design on inside base; few small rim chips; finger marks from smoothing inside and out; fairly well made.
2	38	1209	orange tan ware (reddish yellow 5 YR 6/6) with reddish yellow (5 YR 7/6) surface color with white and grey patching; many small to large black and white inclusions (0.2 mm-4.5 mm); 3 ledge handles on 3 sides of pot; no trace of handle where 4th should be; incised design inside base; 2 small rim chips; visible signs of coiling inside and out; crudely attached handles.
3	62	1314	light red ware (2.5 YR 6/6) with same surface color and yellow to gray patching; many small black and white and a few larger inclusions (0.2 mm-1.5 mm, 4.0 mm); incised design below rim; 4 unevenly spaced ledge handles; many large and small rim chips; some surface scaling inside; signs of coiling inside; clear finger marks from smoothing.
4	4	1207	tannish brown ware (reddish yellow 5 YR 6/6); reddish yellow (5 YR 7/6) surface color with light to dark grey patches; many white, black and red inclusions (0.1 mm-4.0 mm); 5 small rim chips; many pock-marks from inclusions; base has iregular impressions; smoothing inside and out; fairly crudely made.
5	49	1287	chips not sufficient to determine ware description; reddish yellow (5 YR 7/6) surface color with grey to white incrustation; small to medium black and white inclusions (0.2 mm-3.0 mm); 4 small ledge handles unevenly spaced around shoulder; 3 rim chips; some horizontal fingerprints on inside; fairly well made.
6	61	1222	chips insufficient to determine color; light red surface color (2.5 YR 6/8) with red (10 R 4.6) slip; faint traces of roughly horizontal burnishing; many black, white and red small inclusions (0.2 mm-1.5 mm); 4 evenly spaced up-turned ledge handles; few small rim chips; slip worn; fairly well made.

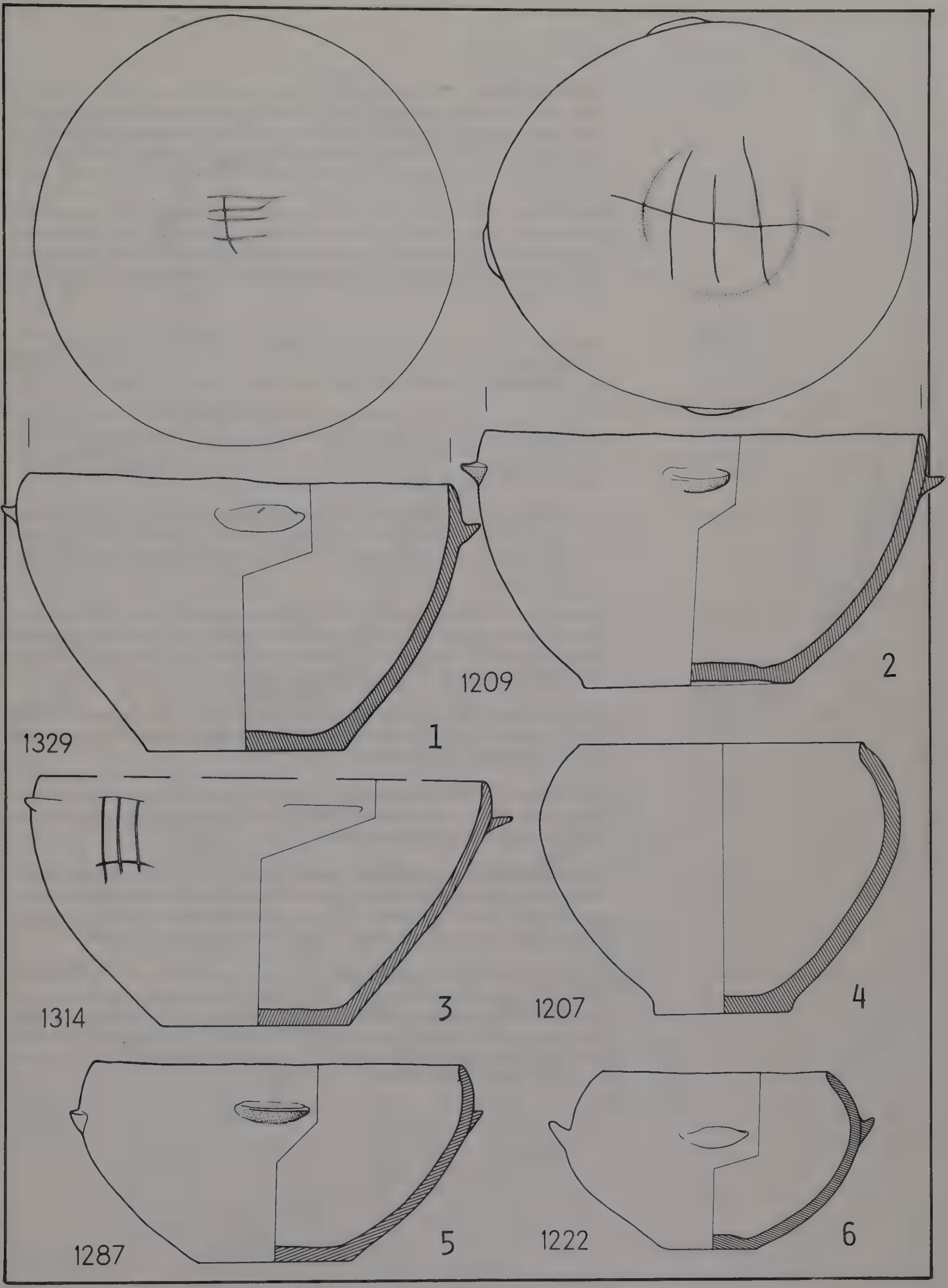


Fig. 15. Tomb A 88 L

No.	Pot No.	Reg. No.	Ware Description
1	24	1310	brown ware (light reddish brown 2.5 YR 6/4); reddish yellow (5 YR 7/6) surface color with grey-black patching; small to medium black and white inclusions (0.2 color with grey-black patching; small to medium black and white inclusions (0.2 mm-3.0 mm); 4 small ledge handles, roughly evenly spaced; 5 fairly large rim chips; many random smoothing marks inside and out; signs of coiling inside.
2	50	1441	light red ware (2.5 YR 6/6) with same surface color; many small red, white and black inclusions (0.2 mm-1.0 mm, few up to 3.0 mm); 3 unevenly spaced ledge handles; large incised design inside base; few small rim chips; faint signs of coiling inside; clear signs of smoothing horizontal to vertical inside and out; base concave; fairly crudely made.
3	67	1328	chips not sufficient to determine ware color; pink (7.5 YR 7/4) surface color with red and grey patching; small inclusions (0.2 mm-1.0 mm); inside base 5 incised lines; slight incrustation; smoothing lines; rough surface; coarse ware; crudely made.
4	46	1215	brownish tan ware (light reddish brown 2.5 YR 6/4); light red (2.5 YR 6/6) surface color with light grey patching; many small black and white and few larger inclusions (0.2 mm-0.5 mm, 3.5 mm); 3 large rim chips, 10 smaller rim chips; smoothed inside and out; fairly crudely made.
5	56	1216	tannish brown ware (light brown 7.5 YR 6/4) with pink (7.5 YR 7/4) surface color; many small black and white and a few large inclusions (0.2 mm-1.0 mm, 5.5 mm); "X" mark on base; 2 large rim chips and 10 smaller chips; roughly smoothed inside and outside surface; crudely made.
6	66	1173	brown tan ware (reddish yellow 5 YR 6/6); reddish yellow (7.5 YR 7/8) surface color with red patching; many small black and white inclusions (0.2 mm-1.0 mm); traces of red paint on inside; 1 large rim chip and few small ones; rough surface; many pock-marks from inclusions; straw impressions; crudely made.
7	45	1407	pale green ware (pale yellow 5 Y 7/3) with same surface color; small to medium black, white and mostly red inclusions (0.2 mm-3.5 mm); 3 incised lines inside base; few tiny rim chips; rough surface; crudely made.
8	75	1327	light red ware (10 R 6/8); same surface color with yellow patching; small black and mostly white inclusions (0.2 mm-1.0 mm); 10 small rim chips; surface smoother than usual for such bowls; fairly well made.
9	83	1241	chips not large enough to determine ware color; light red (2.5 YR 6/8) surface color; many small black and white inclusions (0.2 mm-1.5 mm); 4 knobs evenly spaced around rim; 2 small rim chips; 1 hole from inclusion on outside surface; rough surface; signs of smoothing; stance of pot askew; fairly crudely made.
Not Drawn	85	1309	brownish tan ware (light reddish brown 5 YR 6/4); reddish yellow (5 YR 7/6) surface color with one grey patch and red (7.5 R 5/8) slip; many small to medium black and mostly white inclusions (0.2 mm-3.0 mm); line of raised knobs circle pot, made with sharp instrument; large piece missing from rim; half of base cracked off; numerous rim chips; finger marks of smoothing inside and out; numerous pock-marks from inclusions; fairly crudely made.

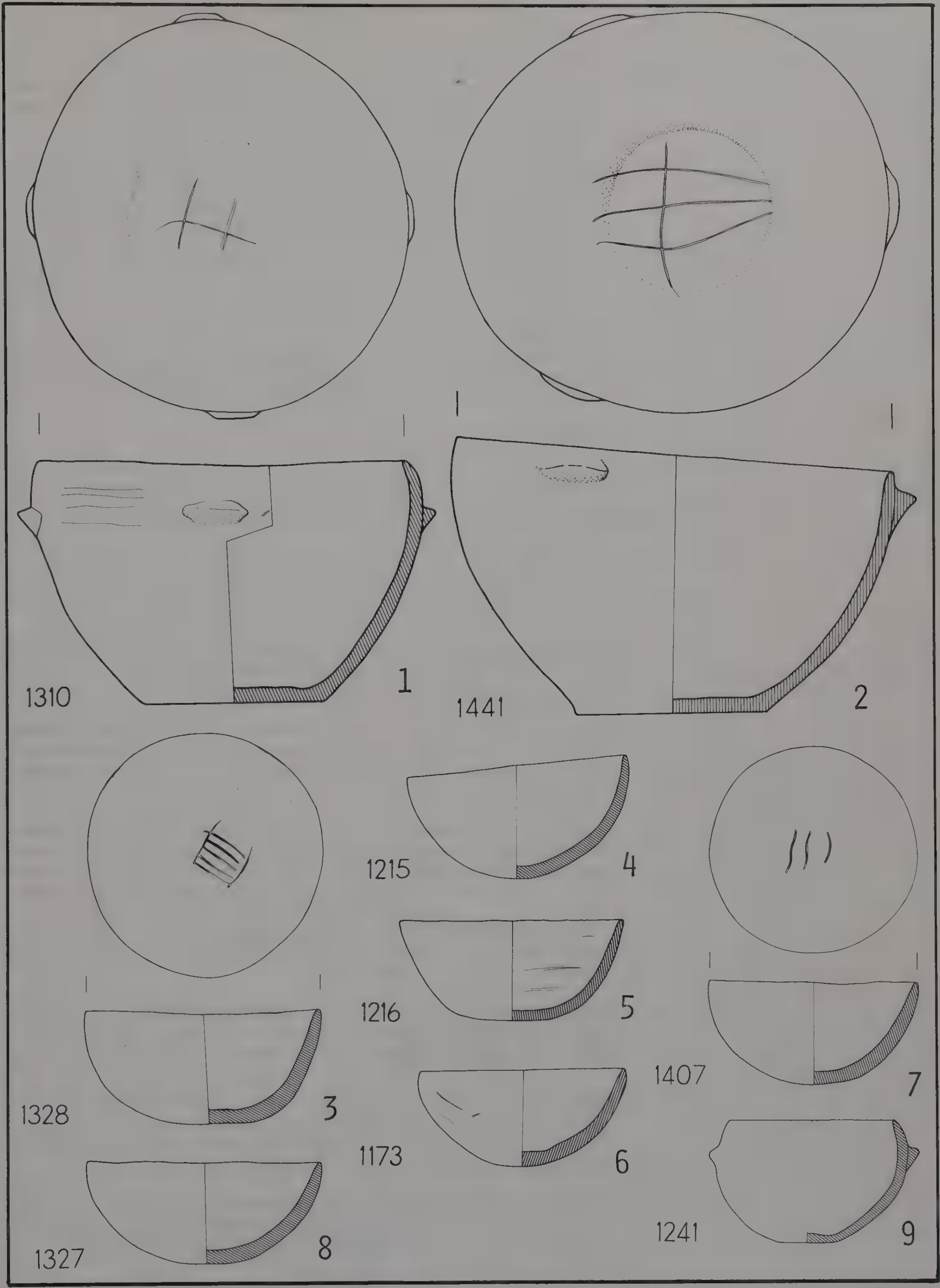
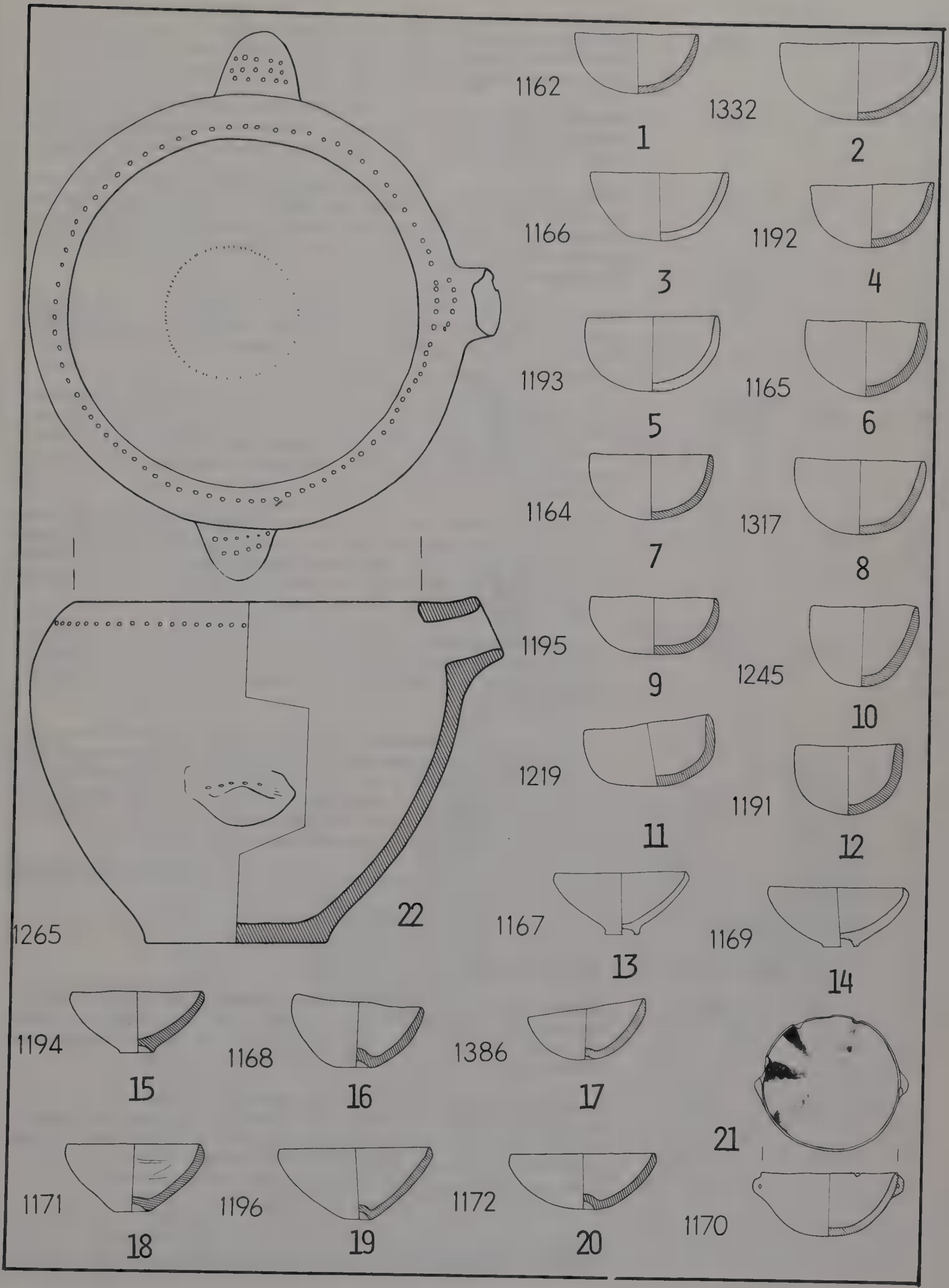


Fig. 16. Tomb A 88 L

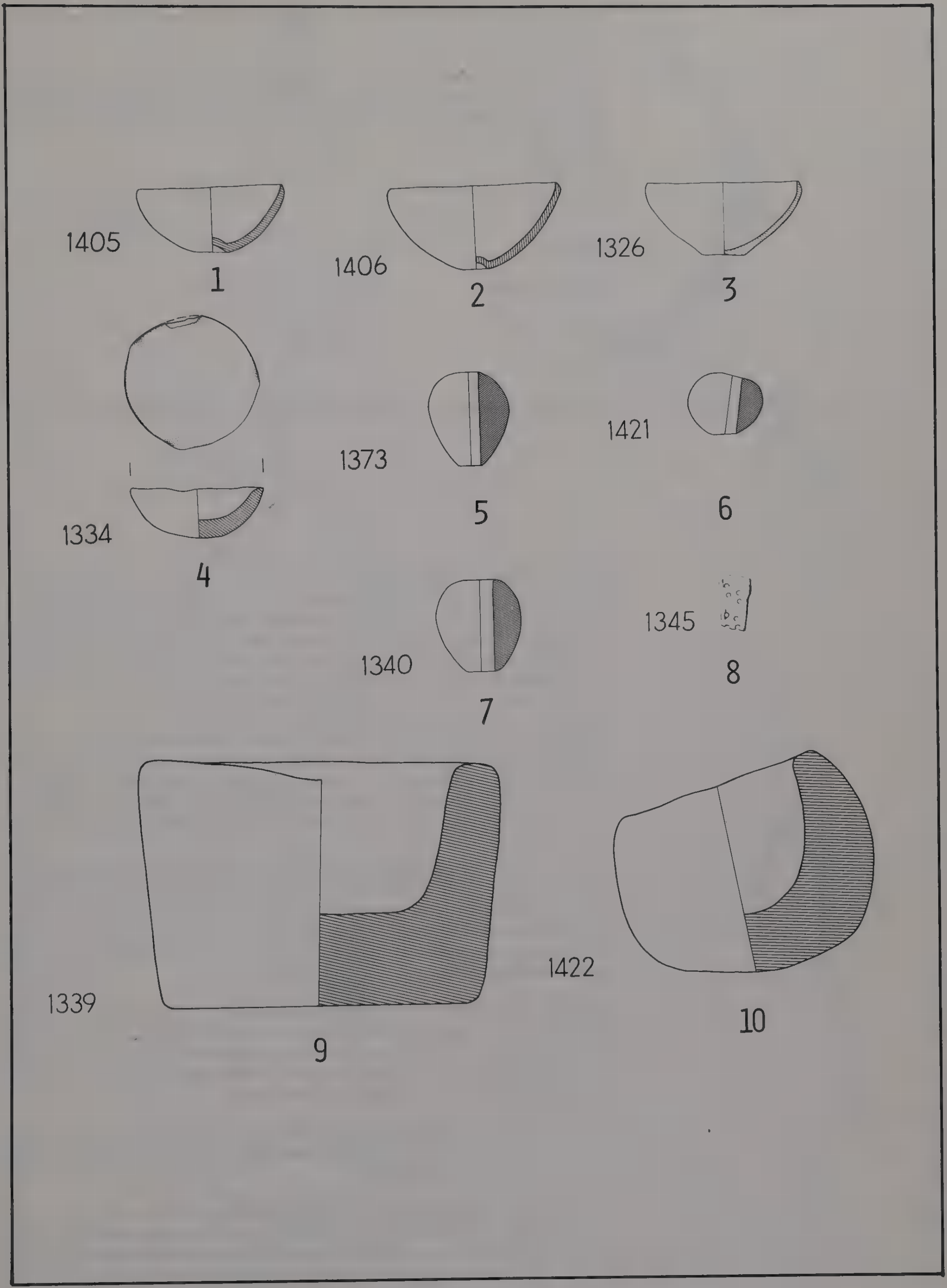
No.	Pot No.	Reg. No.	Ware Description
1	34	1162	brown tan ware (reddish yellow 5 YR 6/6); same surface color with possible faint traces of red slip; many small black and mostly white inclusions (0.2 mm-1.0 mm); 1 large rim chip; symmetrical; fairly well made.
2	32	1332	orange tan ware (reddish yellow 5 YR 7/6) with light red (2.5 YR 6/8) surface color and red (10 R 4/8) complete slip; some signs of horizontal burnish; small to medium mostly black and white inclusions (0.3 mm-2.5 mm); 2 large, 4 small rim chips; few large pock-marks from inclusions; light for its size; fairly well made.
3	53	1166	brownish tan ware (pink 7.5 YR 7/4) with pink (7.5 YR 8/4) surface color; very few small black and white, and few medium inclusions (1.0 mm-2.0 mm); 3 small rim chips; rough surface inside and out; symmetrical; fairly crudely made.
4	47	1192	brown tan ware (yellowish red 5 YR 5/6); reddish yellow (5 YR 6/6) surface color; small white and black inclusions (0.2 mm-1.0 mm); 4 small rim chips; uneven rim; pock-marks from large inclusions inside and out; crudely made.
5	17	1193	missing
6	65	1165	brown tan ware (light brown 7.5 YR 6/4) with reddish yellow (5 YR 6/6) surface color; small black and white inclusions (0.2 mm-1.5 mm); few small rim chips; fairly thick walls; signs of vertical smoothing (finger impressions); crudely made.
7	28	1164	brownish tan ware (reddish yellow 5 YR 6/6) with light reddish brown (5 YR 6/4) surface color with reddish yellow (5 YR 6/6) badly worn slip; barely visible horizontal burnish; very few small black and white inclusions (0.2 mm-1.0 mm); 10 small rim chips; well levigated; very symmetrical; well made.
8	76	1317	orange tan ware (reddish yellow 5 YR 7/6); same surface color with red (10 R 4/8) slip; many small to medium black and mostly white inclusions (0.5 mm-4.0 mm); 10 small rim chips; rough surface; fairly symmetrical; crudely made.
9	27	1195	orange tan ware (reddish yellow 5 YR 6/6) with reddish yellow (5 YR 6/8) surface color; few small red, white and black inclusions (0.2 mm-1.0 mm); 3 small rim chips; rough surface; slightly uneven rim; symmetrical; fingerprints indicate horizontal smoothing on inside; fairly well made.
10	3	1245	brownish tan ware (reddish yellow 5 YR 6/6); reddish yellow (5 YR 7/6) surface color with white to light grey patching; many small black and white and a few larger inclusions (0.2 mm-1.0 mm, 2.5 mm); 1 large and many small rim chips; rounded base; a few pock-marks from inclusions; few straw impressions; crudely made.
11	57	1219	brown tan ware (light brown 7.5 YR 6/4); pink surface color (7.5 YR 7/4); many small to medium red, white and black inclusions (0.2 mm-3.0 mm); few small rim chips; very rough surface; crudely made.
12	20	1191	brownish tan ware (reddish yellow 5 YR 6/6) with pink (5 YR 7/4) surface color; small to medium black and white inclusions (0.2 mm-3.5 mm); 1 large, few small rim chips; rough surface; rim uneven; fairly symmetrical; crudely made.
13	70	1167	light red ware (red 2.5 YR 5/8); light red surface color (10 R 6/8) with yellow patching and traces of red slip (7.5 R 4/4); small black and white inclusions (0.2 mm-1.0 mm); fairly crudely made bottom base; 5 small rim chips; very symmetrical; lines of coarse cloth smoothing visible on inside; well made.
14	37	1169	orange tan ware (reddish yellow 5 YR 6/8); light red (2.5 YR 6/8) surface color with red (7.5 R 4/6) slip; few small to medium black and white inclusions (0.2 mm-2.0 mm); 1 large and several small rim chips; broken in two but mended; slip badly worn; fairly well made.



15	21	1194	brown tan ware (pink 7.5 YR 7/4) with reddish yellow surface color (7.5 YR 7/8); very few small black and white inclusions (0.2 mm-0.5 mm); fairly crude bottom base, concave on bottom; 2 large and 2 small rim chips; finely made.
16	91	1168	brownish tan ware (reddish yellow 5 YR 6/6) with same surface color; many small to medium black and white inclusions (0.2 mm-3.0 mm); concave base; 3 small rim chips; many pock-marks, some large, from inclusions; fairly crudely made.
17	80	1386	chips not sufficient to tell ware color; reddish yellow (7.5 YR 6/6) surface color; many small black and white inclusions (0.2 mm-0.5 mm); simple finger impressions forming concave cavity outside of base; few tiny rim chips; some outside surface scaling; some finger marks from smoothing inside and out; base off-center; fairly crudely made.
18	71	1171	light red ware (10 R 6/8); reddish yellow (5 YR 7/6) surface color with light red patching; small black and mostly white and red inclusions (0.2 mm-1.5 mm); small base formed by finger impression; 10 small rim chips; thin ware; good stance; very symmetrical; well made.
19	54	1196	brownish tan ware (light brown 7.5 YR 6/4); pink (7.5 YR 7/4) surface color; many small to medium white and mostly black inclusions (0.2 mm-2.5 mm); made with finger impression; base concave outside, convex lump inside; few tiny rim chips; symmetrical; good stance; impressions on outside of smoothing with coarse cloth, fairly well made.
20	84	1172	orange tan ware (reddish yellow 5 YR 6/6); reddish yellow (5 YR 7/6) surface color with red (10 R 5/8) slip; many very small black and mostly white and few large inclusions (0.2 mm-0.5 mm); base is finger indentation, concave outside, convex lump inside; tiny chips all around rim; slight carination at rim; very symmetrical; number of straw impressions near base; well made.
21	90	1170	red ware (10 R 4/8); light red (10 R 6/8) surface color with one yellow patch; small to medium black and white inclusions (0.5 mm-2.0 mm); 2 small lug handles on opposite sides; rim badly chipped; partially mended; rough exterior; finely levigated; fairly crudely made.
22	6	1265	orange tan ware (light reddish brown 2.5 YR 6/4); light red (2.5 YR 6/8) surface color with black patching; many small black and white and red inclusions (0.4 mm-1.0 mm) and a few larger (2.0 mm-3.0 mm); large spout; round puncture marks; 2 upturned ledge handles with 2 rows of puncture marks on top; 6 puncture holes on top of spout; few rim chips; spout rim almost entirely broken away; coiling not plainly visible, but fingerprints from smoothing coiling inside and out.

Fig. 17. Tomb A 88 L

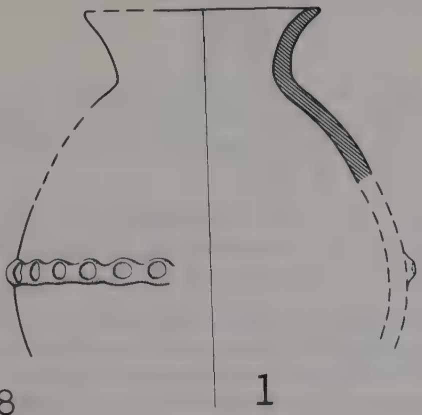
No.	Pot No.	Reg. No.	Ware Description
1	89	1405	chips insufficient to tell color of ware; reddish yellow (7.5 YR 7/6) surface color with red patching; small black, white and red inclusions (0.2 mm-1.0 mm); base pushed up, concave outside, convex inside; 1 small rim chip; broken in half but mended; symmetrical; nicely made.
2	52	1406	brown tan ware (light brown 7.5 YR 6/4); reddish yellow surface color (7.5 YR 7/6) with red (2.5 YR 4/8) slip; many small to medium black and white inclusions (0.2 mm-4.0 mm); finger indentation of base created concave cavity outside; 2 small rim chips; some scaling of outside surface; inclusions larger than usual for this size bowl; pock-marks inside and out from inclusions; fairly well made.
3	81	1326	chips not sufficient to determine ware color; light red (2.5 YR 6/8) surface color with yellow and grey patching and weak red (7.5 R 4/4) slip; few small white and black



			inclusions (0.2 mm-1.0 mm); few small rim chips; many pock-marks from inclusions; well made.
4	88	1334	orange tan ware (reddish yellow 5 YR 7/6); light red (10 R 6/8) surface color; many medium to large black and white inclusions (0.5 mm-4.0 mm); 3 slight finger impressions around rim; 1 large rim chip; very large inclusions for such a small bowl; very crudely made.
5		1373	mace-head
6		1421	mace-head
7		1340	mace-head
8		1345	perforated bone
9		1339	sandstone bowl
10		1422	basalt bowl

Fig. 18. Tomb A 56

No.	Pot No.	Reg. No.	Ware Description
1	34	1458	brownish tan ware ("reddish yellow" 5 YR 7/6) with surface color "light red" (10 R 6/8); "red" slip (7.5 R 5/6), badly peeling; vertical burnish on neck and apparent vertical over rest of jar; raised band with finger impressions (rope moulding); small ridge at base of neck; some small to medium black and white inclusions (0.2 mm-3.5 mm); large rim chips; only part of body preserved in pieces; heavy incrustation; partially mended; coiling visible on inside near neck, vertical finger impressions visible on inside; point of neck attachment visible from inside.
2	2	487	orange tan ware ("light red" 2.5 YR 6/8) with light red surface color (2.5 YR 6/8); slip is light red (2.5 YR 6/8), deeper red on neck; burnish is vertical, complete; 2 small ledge handles flaring up with slight finger indentations; small and medium black and white inclusions (0.2 mm-2.5 mm); few rim chips; chips on both handles; slip damaged in several places; 2/3 of body covered with incrustation; neck joined.
3	4	483	orange tan ware ("reddish yellow" 5 YR 7/6); surface color same with gray patching; slip red-light red (2.5 YR 5/8-2.5 YR 6/8), badly cracked and chipping; only slight traces of burnish, appears to have been random and vertical; small to medium black and white inclusions (0.2 mm-3.0 mm); 2 strap handles on side of body where one would expect ledge handles; numerous chips around rim; large crack in neck; neck joined; fairly well made.
4	23	594	orange tan ware ("light red" 2.5 YR 6/8) with pink (7.5 YR 7/4) surface color and light red (2.5 YR 6/6) slip; apparent vertical burnishing; small to large black and white inclusions (0.2 mm-3.5 mm); 3 very slightly raised knobs equally spaced between shoulder and neck; 5 chips on rim; 2 large cracks from rim to middle; smaller crack rim to base of neck; fairly well made.
5	5	488	brownish tan ware ("very pale brown" 10 YR 7/4) with same surface color and red (2.5 YR 4/8) slip; small to large black and white inclusions (0.2 mm-6.5 mm); chipped around rim; crudely made.
6	33	1459	orange tan ware ("reddish yellow" 5 YR 7/6) with same surface color; slip covered with light green incrustation and is red (10 R 4/8); few small black and white inclusions (0.2 mm-1.0 mm); trefoil lip; rim only at handle; handle attachment at rim evident; both over and outside of rim.



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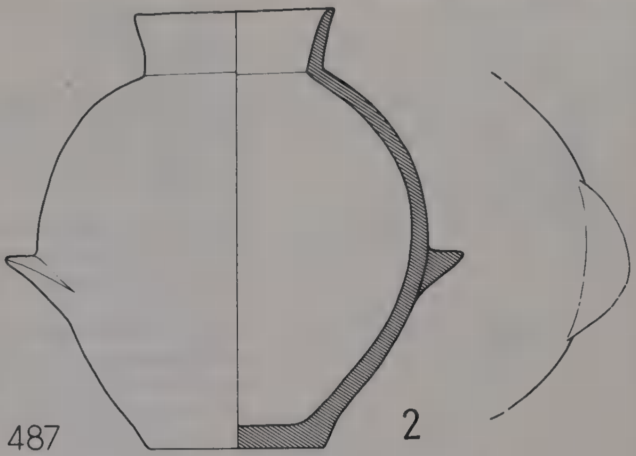

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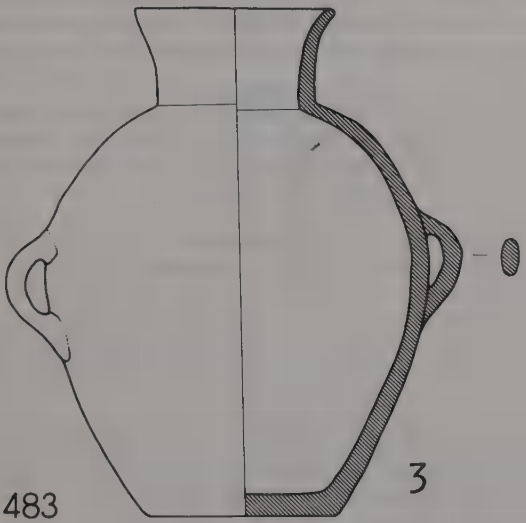

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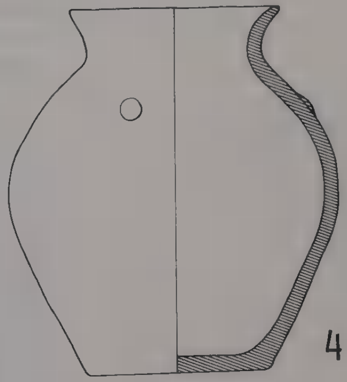

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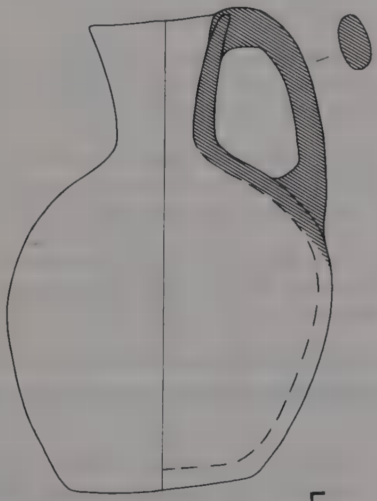

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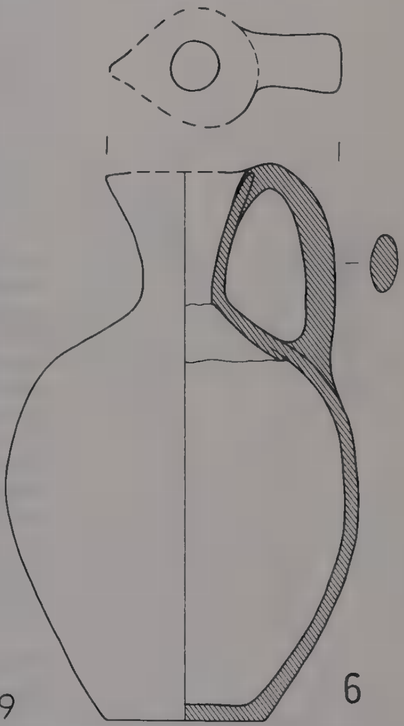

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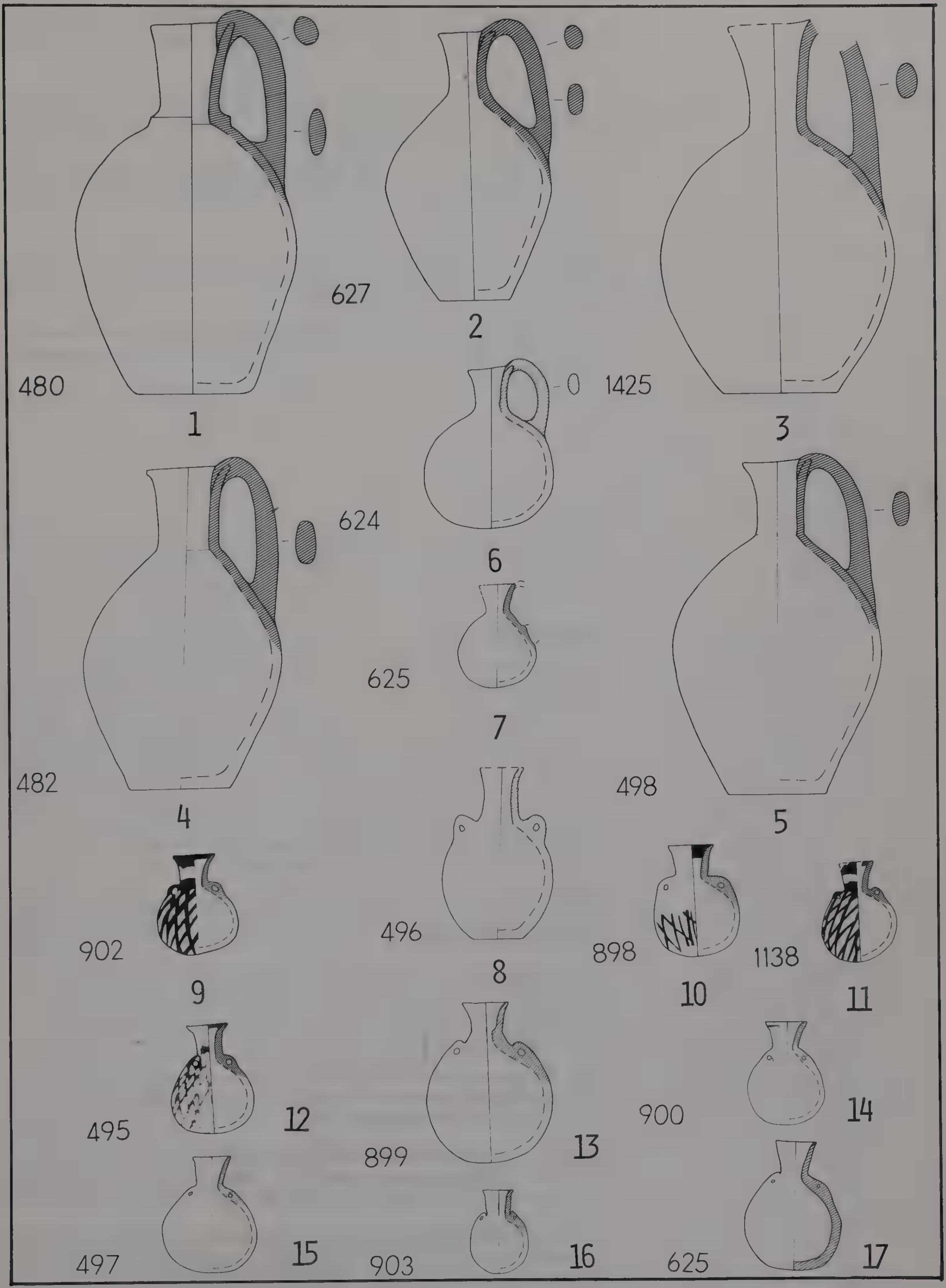
Fig. 19. Tomb A 56

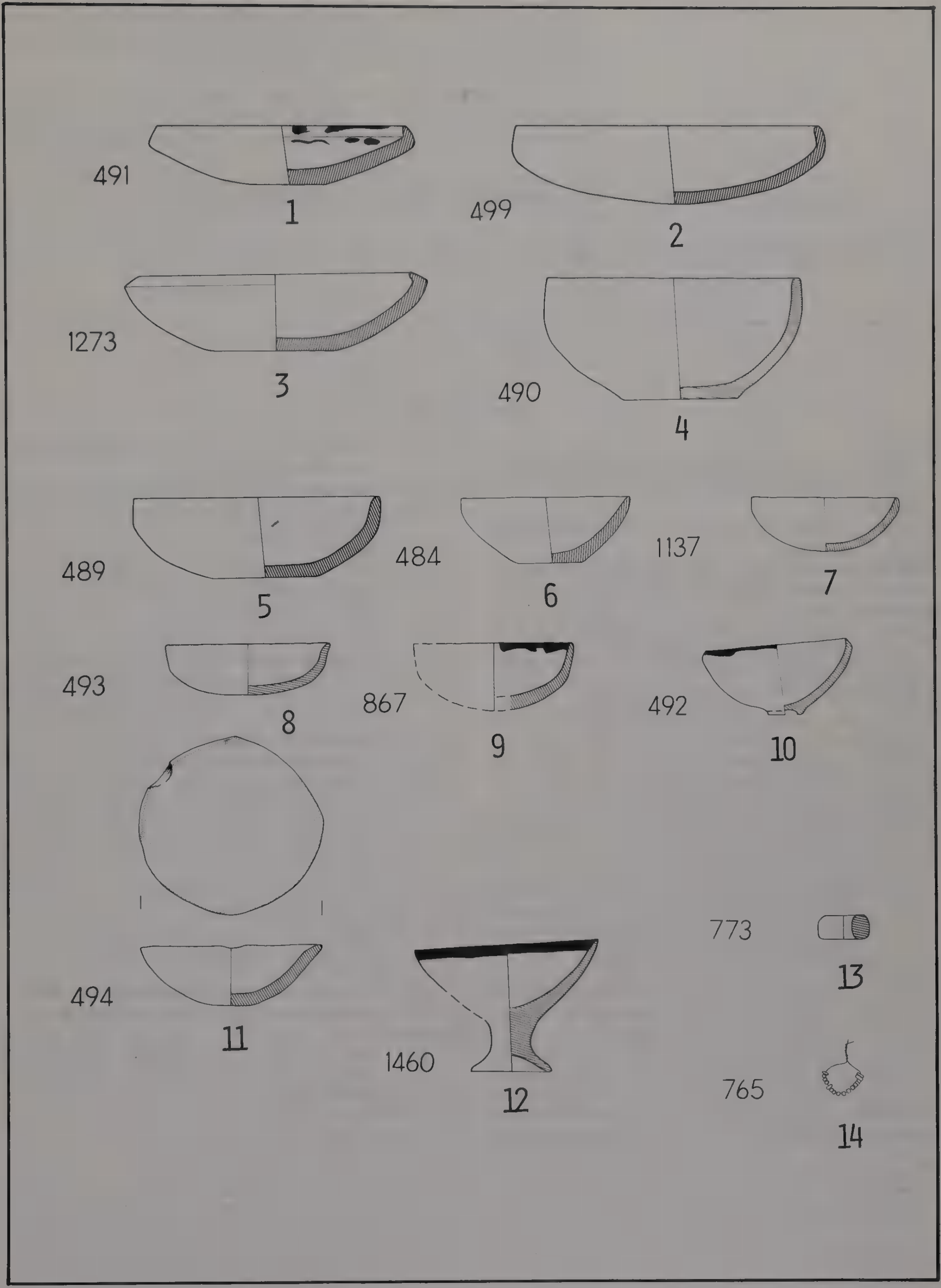
No.	Pot No.	Reg. No.	Ware Description
1	6	480	brownish tan ware (“reddish yellow” 7.5 YR 7/8); surface color light red (2.5 YR 6/8) with brown and grey patching; medium to large black and white inclusions (1.0 mm-4.0 mm); small collar around base of neck; rim mostly chipped; finger impressions on surface; poorly made.
2	22	627	orange tan ware (“reddish yellow” 5 YR 7/6) with same surface color; red slip (10 R 5/8), complete with some peeling; vertical, complete burnish; very small black and white inclusions (0.2 mm-0.5 mm); few rim chips; very well made.
3	31-32	1425	orange tan ware (“light red ” 2.5 YR 6/8); surface color light red (2.5 YR 6/6) with poorly preserved red (10 R 5/8) slip; traces of vertical burnishing on bottom half of pot and outside of handle; small black and white inclusions (0.2 mm-1.5 mm); crude “X” incised on bottom; rim chipped all around; long crack half-way around middle; fairly crudely made.
4	7	482	orange tan ware (“reddish yellow” 5 YR 7/6); same surface color with red slip (10 R 5/8); slip pock-marked with white-greenish incrustation; completely burnished; small black and white inclusions (0.2 mm-1.0 mm); chipped rim; well made.
5	14	498	orange tan ware (“reddish yellow” 5 YR 7/6); surface color same but with larg grey patch over half; slip complete, (“red” 10 R 4/8 to “red” 2.5 YR 5/6); complete burnish; small black and white inclusions (0.2 mm-1.0 mm); large rim chip; well made.
6	21	624	orange tan ware (“pink” 7.5 YR 7/4) with same surface color; red slip (10 R 4/6); vertically burnished; small to medium white and grey inclusions (0.2 mm-2.0 mm); chipped rim; poorly made.
7	18	625	orange tan ware (“reddish yellow” 5 YR 7/6) with same surface color; small black and white inclusions (0.2 mm-1.0 mm); handle broken off; large rim chip; large crack at base of neck; 2 chips from body.
8	15	496	orange tan ware (“light red” 2.5 YR 6/6); surface color same with slight yellow patches; small to medium black and white inclusions (0.2 mm-2.5 mm); two amphoriskos-type lug handles; chipped rim all around; surface smooth.
9	37	902	orange tan ware (“pink” 7.5 YR 7/14) with same surface color; small black and white inclusions (0.2 mm-1.0 mm); red painted (slip) net design on body; fairly even red ring around rim; half of rim chipped away; fairly crudely made.
10	24	898	orange tan ware (“pink” 7.5 YR 7/4) with same surface color; small to medium black and white inclusions (0.2 mm-3.0 mm); traces of red paint (slip) net design on body; few small rim chips; some incrustation; joined neck.
11	29	1138	orange tan ware (“pink” 5 YR 7/4) with surface color of light red (10 R 6/8); small white and black inclusions (0.2 mm-1.5 mm); traces of red painted (slip) net design on body; large chips around half of rim; fairly well made.
12	16	495	orange tan ware (“pink” 7.5 YR 7/4) with same surface color; small white and black inclusions (0.2 mm-1.0 mm); few holes in body where large inclusions have broken out; few small rim chips; well made.
13	30	899	orange tan ware (“pink” 7.5 YR 7/4); same surface color with grey to black patch on bottom; small to medium black and white inclusions (0.2 mm-2.5 mm); painted (slip) net design; neck joined.
14	25	900	orange tan ware (“pink” 7.5 YR 7/4) with same surface color; small black and white inclusions (0.2 mm-2.0 mm); net design; small rim chip; poorly made.
15	3	497	orange tan ware (“pink” 7.5 YR 7/4); light reddish brown (5 YR 6/4) surface color



			with yellow patching; small black and white inclusions (0.2 mm-1.0 mm); faint traces of red painted (slip) net design; half of rim chipped; some incrustation; fairly crudely made.
16	26	903	orange tan ware ("pink" 5 YR 7/4) with same surface color; small white and black inclusions (0.2 mm-1.0 mm); reddish brown paint (slip) net design on body; large rim chip; large crack through one handle to base; high-placed lug handles: well made.
17	20	626	orange tan ware ("pink 7.5 YR 7/4); same surface color with some reddish patching; small black and white inclusions (0.5 mm-1.5 mm); large crack through middle of body; poorly made; heavily incrusted.
Not Drawn	27	901	orange tan ware ("pink" 7.5 YR 7/4); light red (2.5 YR 6/8) surface color with yellow patching; small white and mostly black inclusions (0.2 mm-1.5 mm); rim chips all around; some incrustation; fairly crudely made.
Not Drawn	19	625	orange tan ware ("pink" 7.5 YR 7/4) with reddish yellow surface color (5 YR 7/6); very few small white and black inclusions (0.2 mm-1.0 mm); traces of net painting near handles; 5 chips on rim; no sign of joined neck.

Fig. 20. Tomb A 56

No.	Pot No.	Reg. No.	Ware Description
1	1	491	orange tan ware ("pink" 5 YR 8/4); reddish yellow (5 YR 7/6) surface color with red (7.5 R 5/8) slip; random burnish; small white and black inclusions (0.3 mm-2.0 mm); rim chipped most of the way around; fairly well made.
2	9	499	orange tan ware ("pink" 5 YR 8/4) with same surface color with yellow patching; slip red (7.5 R 4/8), complete, chipped and covered with incrustation; random burnish; very small white and black inclusions (0.5 mm); few small rim chips with two cracks in rim; fairly well made.
3	38	1273	light red (2.5 YR 6/8) with reddish yellow (5 YR 7/6) surface color; slip complete, red (10 R 4/8); small to medium white and black inclusions (0.2 mm-3.5 mm); large "X" burnished across bottom; few small rim chips; large chip on outer surface; very well made.
4	10	490	orange tan ware ("pink" 7.5 YR 7/4) with same surface color; complete slip, red (2.5 YR 5/8); random and horizontal burnish; very small white and black inclusions (0.2 mm-0.7 mm); few small rim chips; well made.
5	12	489	orange tan ware ("pink" 5 YR 8/3); surface color same with red slip (10 R 4/8); random burnish; small white and black inclusions (0.2 mm-1.0 mm); 1 rim chip; well made.
6	8	484	brown ware ("light brown" 7.5 YR 6/4); reddish yellow (7.5 YR 6/6) surface color with red (10 R 4/6) slip; small to medium black and white inclusions (0.2 mm-2.5 mm); 4 sets of vertical incised slashes on inside; 2 sets with 3 lines, 2 with 5 lines; small rim chips; fairly crudely made.
7	28	1137	orange tan ware ("reddish yellow" 5 YR 7/6); surface color light red (2.5 YR 6/8) with yellow patching and grey patch on bottom; red slip (7.5 R 5/8); small black and white inclusions (0.2 mm-1.5 mm); 5 small rim chips; thin ware; fairly crudely made.
8	17	493	orange tan ware ("reddish yellow" 5 YR 7/6) with same surface color; light red slip (10 R 6/6) almost completely chipped away; small white and black inclusions (0.2 mm-1.0 mm); large chip from rim to carination; fairly well made.
9	35	867	brown ware ("reddish brown" 2.5 YR 5/4); light brown (7.5 YR 6/4) surface color with strong brown (7.5 YR 5/6) slip; random burnish; small white inclusions (0.2 mm-0.5 mm); band on inside; slightly carinated; well made.



10	13	492	orange tan ware ("pink" 5 YR 7/3); surface color reddish yellow (5 YR 7/6) with grey patching; very few small black and white inclusions (0.2 mm-1.5 mm); 6 small rim chips and 1 large rim chip; crude lop-sided bottom base.
11	11	494	brown ware ("light brown" 7.5 YR 6/4); light yellowish brown (10 YR 6/4) surface color with red patching; small to medium white and grey inclusions (0.2 mm-2.0 mm); 4 slight thumb indentations on rim (wicks); 2 chips on rim; crudely made.
12	36	1460	orange tan ware ("reddish yellow" 5 YR 7/6); pink (7.5 YR 7/4) surface color; very few small black and white inclusions (0.2 mm-1.0 mm); few rim chips; very well made.
13		773	stone object
14		765	beads

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A Preliminary Report on the Human Remains from the Bab edh-Dhra Cemetery

DONALD J. ORTNER

Earlier excavations of the large cemetery area just south of the town site of Bab edh-Dhra, Jordan, have uncovered burials from each of the major phases of EB occupation (Lapp 1968; Schaub 1973; Rast and Schaub 1974). During the period of use from about 3150 to 2200 B.C., there appear to be significant cultural changes which suggest the possibility of time-dependent biological variation in the peoples living at Bab edh-Dhra. At any given time in the Early Bronze Age there were also regional-cultural and biological variations in the Near East which probably reflected patterns of genetic interchange, suggesting that the people of Bab edh-Dhra may have had more contact with one region than another. Related to these broad problems, but not as great in scope, are other aspects of the skeletal biology of the people of Bab edh-Dhra such as population size, longevity, sex ratios, and disease, which add depth to the attempt to reconstruct the biological history of the populations. Both the broad problems and the more specific details provide the focus for the cemetery excavations and subsequent research on the skeletal material recovered in 1977.

The discussion below is a preliminary report on the study of excavated human remains of the 1977 season at the cemetery. The skeletal material was shipped to the Smithsonian Institution for cleaning, restoration, and analysis. The work has not been finalized at this writing, but in the light of research done thus far it is possible to present data and observations below. The format follows the presentation of Schaub on the tombs above.

The Human Remains from the EB IA Tombs

Shaft Tomb A 78

The shaft fill of Tomb A 78 contained small fragments of human bone and teeth at various levels. These apparently were dropped on the soil around the shaft as burials were carried to the tomb. When the shaft was backfilled, following the sealing of the chambers, the bone fragments and teeth were included with the fill.

The tomb complex included four chambers. The northwest chamber had considerable roof fall but no significant silting. This chamber contained the skeletons of four individuals. Just inside and to the left of the entryway was the skeleton of a newborn infant. Arranged to the left of the chamber were the skulls of three individuals including a child about 9 years of age and two adult female skulls probably in excess of 45 years of age. In the center of the chamber was a pile of postcranial bones associated with the three skulls. Beneath the skulls and the long bones was the remnant of a reed mat, portions of which were preserved and brought back to the Smithsonian Institution. A left and right femur found in the central bone pile and probably from the same individual, are sufficiently intact so that they can be reconstructed to measure total maximum length. On the basis of this measurement the estimated stature of the individual, using regression formulae developed by Trotter and Gleser (1952) is 159 cm.

The northeast chamber contained extensive roof fall. Architecturally the most vulnerable part of

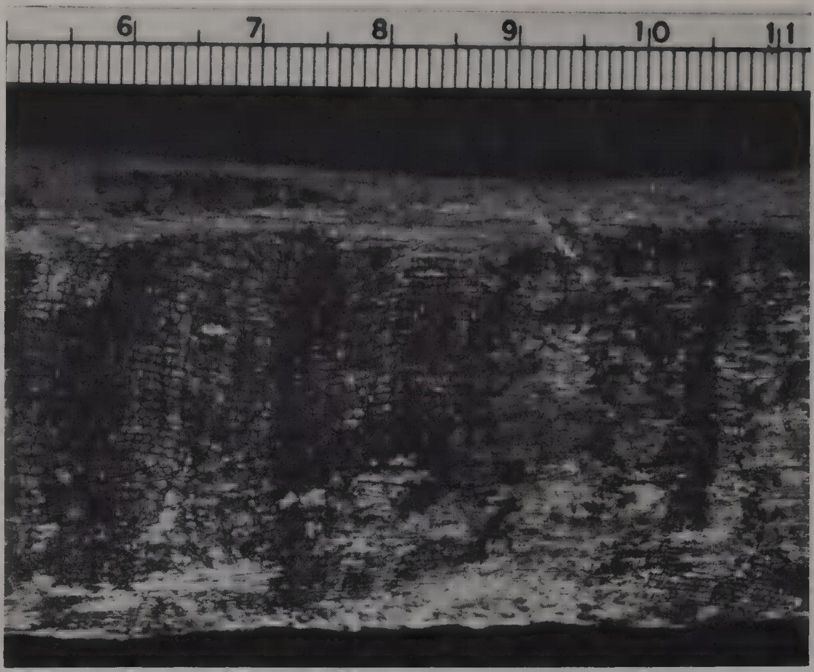


Fig. 1. A portion of a long bone from southwest chamber of shaft Tomb A 78, showing the imprint of cloth on the bone surface.

the chamber was the central portion of the roof. When the marl forming the roof collapsed, it damaged the skeletal material more than the pottery. In Tomb A 78 NE the skeletal material was badly crushed. Since in most cases the roof fall did not seriously damage the skeletons, this situation is unusual. Two possible explanations exist: (1) The skeletal material was very fragile at the time of interment and thus would be crushed regardless of when the roof fall occurred or (2) the skeletal material deteriorated with time after the interment so that it was fragile at the time of the roof fall. The latter possibility would suggest that a period of several to many years elapsed between interment and roof fall. In most chambers the roof fall took place when the skeletal material was still strong enough to resist significant damage. This chamber contained at least one adult and one child's skeleton.

The southeast chamber of Tomb A 78 contained only a small amount of fragmentary skeletal material. The skull fragments were mixed with the postcranial bones. Assuming care of the skeletal material during both exhumation and reburial in the tomb chamber, this fragmentary condition indicates that the skeletal material had deteriorated during primary burial. This suggests a longer than usual elapsed time for the primary burial phase. Unfortunately the skeletal material from this chamber was lost during shipment between Kerak and Amman, so further details are not available.

The southwest chamber of Tomb A 78 had been somewhat silted, thus making recovery of the skeletal material difficult. Three skulls were arranged to the left, with the postcranial bones in the center of the chamber. Two of the skulls were adult, while one was a child 6-8 years of age. The first skull encountered in the chamber contained a few fragments of bones of a child, along with other fragments of the adult skull itself. This suggests that some mixture of bones took place before interment in the chamber. The postcranial bone cluster contained, in addition, the long bones of an adolescent 14-16 years of age, making a total of four individuals represented in the chamber. Some of the long bones of the adult skeletons had very distinct impressions of a finely woven cloth which may have been clothing or cloth covering the bone pile as illustrated in fig. 1.

Shaft Tomb A 79

The shaft of Tomb A 79 was never clearly defined. Initially the possibility of a shaft was considered on the basis of a disturbance in the caliche layer found about 20 cm below the surface in test trench number 4. This disturbance was irregular in shape, as if a small stream of water eroded it. The chambers in Tomb A 79 were heavily silted with at least half of the chambers filled. The silting made recovery of the skeletal material difficult and increased the possibility that some skeletal specimens, such as those of infants, were not recovered.

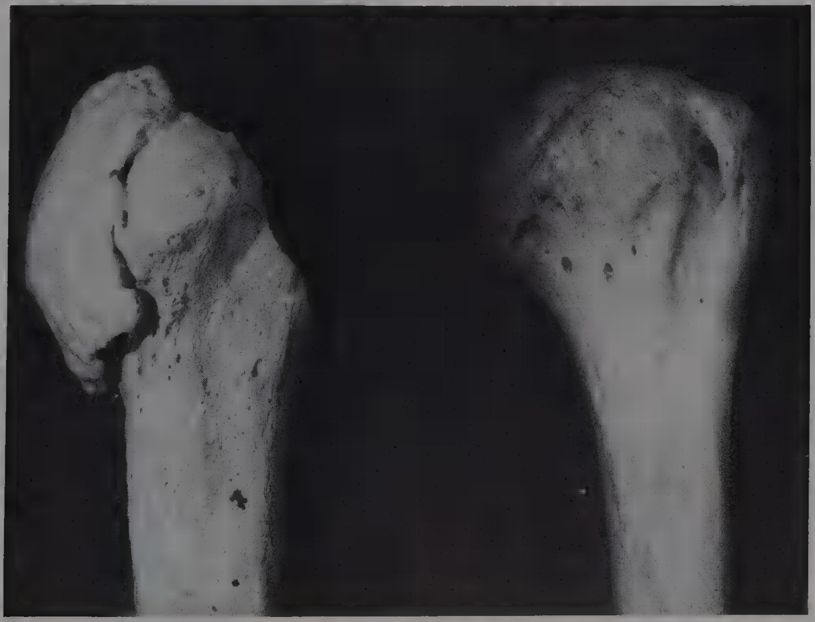
The north chamber of Tomb A 79 contained skull fragments of an adult male, a probable adult female, and a 6-8-year-old child. In addition, the postcranial bones included bones of another child about the same age, and a younger child about 2 years of age. Beneath the skeletal material were impressions of reed matting. The east chamber of A 79 contained the skeletal remains of two individuals, an adult and a child. Impressions of reed matting were also found under the skeletons. Two adult skulls, one female and the other possibly male, were found in the south chamber of A 79. The postcranial bones of these individuals were mixed with the postcranial bones of a 4-5-year-old child. Again reed matting impressions were found in the silt below the bones. Field notes indicate the presence of five or possibly six skulls in a row on the left side of the west chamber of A 79. In the laboratory I have only been able to identify the skulls of four individuals. The heavy silting, however, may have made recovery of all skulls impossible. One of the skulls is that of a child between 6-8 years of age. The other recovered skulls are all adult—one male, one female, and the third undetermined.

Shaft Tomb A 80

As in the shaft of Tomb A 78, some fragments of human bones and teeth were found in the shaft fill of Tomb A 80. Four chambers are associated with this tomb. All but the east chamber had considerable silting.

The north chamber of A 80 contained the fragmentary and poorly preserved remains of two adults. The left humerus of one of these skeletons (fig. 2) has a rather unusual and interesting pathological condition. The articular surface of the proximal humerus is markedly flattened, with extensive arthritic growth of bone on the periphery of the joint. The axis of the articular surface has deviated distally. The bone itself is clearly from an adult, but the pathological condition is longstanding. A fracture through the neck of the humerus or traumatic separation of the proximal epiphysis of the humerus during the growth phase of the individual is the initial event in this pathology. This was followed by distal displacement of the epiphysis and ultimate healing in this abnormal position. It is unfortunate that preserva-

Fig. 2. The proximal end of a left humerus from north chamber of shaft Tomb A 80 with probable traumatic separation of the proximal epiphysis during childhood followed by fusion in an abnormal position (left specimen in figure). The pathological humerus is compared with a normal humerus on the right.



tion of the rest of the shoulder joint is so poor. Impressions of reed matting were under the skeletal material.

Two fragmentary adult skeletons were found in the east chamber of A 80. The skulls typically were placed to the left of the chamber,with postcranial bones in the center. One skeleton was male, the other female. As in the north chamber, impressions of reed matting were found beneath the bones.

An adult male in excess of 50 years of age, a young female 18-20 years of age, and two children 3-4 years of age were found in the south chamber of A 80. Reed matting impressions were also found under the skeletons. The west chamber of A 80 contained skull fragments of a child about 6 years of age, the bones of a child about 12 years of age, and the bones of two adults. In addition to long bones of the above individuals, long bone fragments of a newborn infant and similar bones of a 6-year-old child were encountered in the postcranial bone pile. Reed matting impressions were found in the silt under these bones.

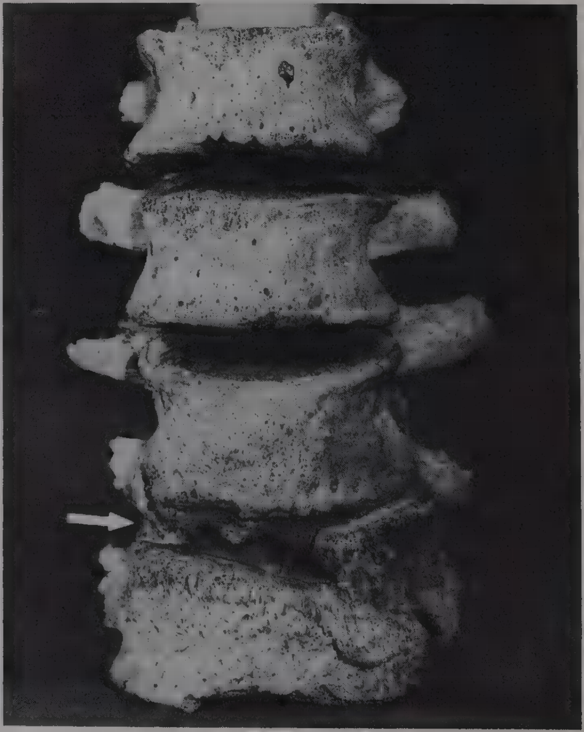
Shaft Tomb A 100

The east chamber of Tomb A 100 has considerable interest for several reasons. The first of these is the fact that there appear to be two clusters of bones: one to the left of the chamber and the other to the right. All of the skeletons are secondary burials, but there were two clusters of bones which suggest two separate episodes of burying. Associated with each of the bone clusters were distinct pottery clusters. There was a large cluster of pottery tomb gifts to the right of the tomb chamber which is more or less divided by the bone pile.

After carefully restoring and sorting material, it became apparent that the chamber contained the skeletal remains of at least 10 individuals. Four of these were newborn infants. The chamber also contained the skeletal remains of two children. The age of the youngest can be estimated at 5 years, based on the length of the femur. The other child is approximately 10 years of age, again on the basis of femur length. There is an interesting young adult skeleton approximately 18 years of age, estimated from the fusion of some of the skeletal growth centers. On the basis of femur length the stature can be estimated at 164.3 cm or approximately 65 inches tall. All of the growth centers of the long bones of the lower limb were fused as one would expect at this age, so that this figure represents the maximum stature that the individual would have attained. The most interesting feature of the skeleton is the marked destruction of the interior portion of the fourth lumbar vertebral body (fig. 3). Slight bony reaction is apparent on the periphery of this destructive process and also slight bony reaction on the fifth lumbar vertebra. There is little evidence of healing in response to this destructive process. The age of the individual and the morphology of the lesion are strongly indicative of tuberculosis, especially the syndrome of tuberculosis called Pott's disease in which the spine is deformed as a result of the infectious destruction of one or more of the vertebrae. In this individual the vertebral collapse would have produced a slight anterior angular deformity of the spine. The evidence of peripheral bony reaction to the destructive condition indicates that the individual lived for some time with the deformity.

One of the adult skeletons is that of a female aged approximately 50 years or more at the time of death. There has been a marked loss of bone mass in the skeleton, making the bones very light. This abnormal loss of bone mass is a condition known

Fig. 3. The lumbar vertebrae of a young male skeleton from the east chamber of Tomb A 100, showing marked destruction of the fourth vertebral body (arrow). The destructive nature of the lesion and the absence of significant healing are characteristic of vertebral tuberculosis (Pott's disease).



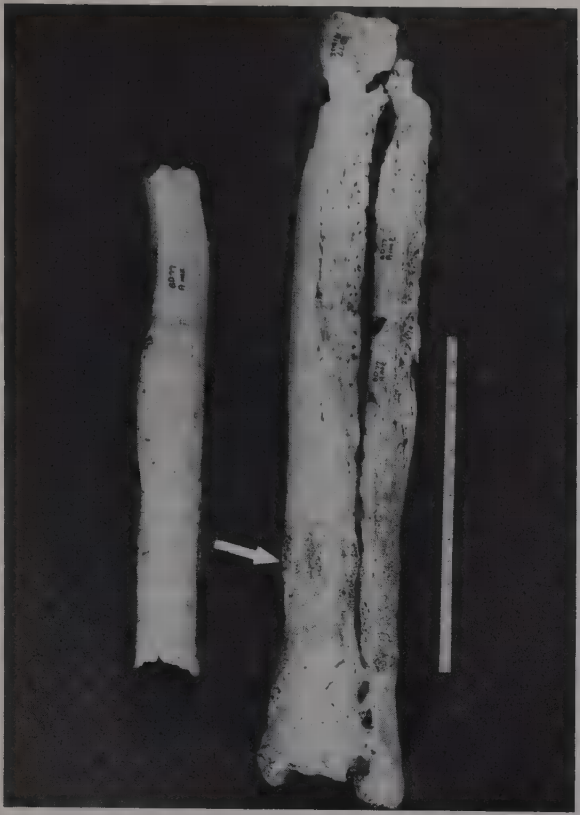


Fig. 4. The fused left tibia and fibula and right tibia of an adult female from the east chamber of Tomb A 100. All three bones show evidence of infectious disease (osteomyelitis). The circular lesion on the anterior distal end of the left tibia and fibula (arrow) is a typical bony response to an overlying soft tissue ulcer.

as osteoporosis and is a well-known clinical condition in the bone tissue of postmenopausal women. In addition to the problem of loss of bone mass, this particular woman suffered from a rather severe chronic case of osteomyelitis, an infectious disease of the bone marrow. The most marked response to the disease is seen on the left tibia and fibula (fig. 4) and is characterized by an increase in the thickness of the bone in a very irregular fashion. Also the tibia and fibula are fused between the distal joint surfaces. On the anterior portion of both the tibia and fibula there is a fairly large circumscribed lesion of more reactive bone. This lesion is suggestive of a disease process that was active at the time of death. The nature of the lesion is highly suggestive of the bone tissue response to an overlying ulcer.

There are two adult male skeletons in this chamber, the first of which is probably in the 45-50-year age range. This particular specimen is the tallest of all of the individuals in this tomb. The stature estimate on the basis of femur length is 175.3 cm or about 5 ft 9 in. This particular individual does not have any apparent disease in the skeleton, and thus the cause of death is completely unknown. The other adult male skeleton is at least 50 years of age. The estimated stature is 169 cm or approximately 5 ft 6 in. The interesting feature of this particular skeleton is the evidence for dislocation of the right hip. The acetabulum (the socket of the hip joint) of the right innominate bone is shallow with considerable arthritic degeneration on the periphery of the joint. The head of the femur is enlarged, and there is a large defect in the articular surface of the femoral head, where the ligament that attaches the acetabulum to the femoral head has eroded the surface of the joint after the dislocation had taken place.

It may be no more than a coincidence that the most dramatic cases of skeletal disease noticed thus far in our study of the skeletal material have been found in one chamber. The possibility that the remains of obviously diseased individuals would have been placed in a separate chamber should be considered in future excavations.

The south chamber of Tomb A 100 contained fragments of an infant's skull, the skull of a child about 8 years of age, and three adult skulls all arranged to the left of the chamber. Represented in the postcranial bone pile were the remains of an infant, a 3-6-year-old child, a 6-8-year-old child, a 10-12-year-old child and two adults. It is apparent that there are more individuals represented by the postcranial bones than by the skulls. There are no skulls for the children 3-6 or 10-12 years of age. This lack of congruence between skulls and postcranial material has been noted in other tomb chambers. The total number of individuals represented by the skeletal remains is seven. There were three adult skulls and the skull of a child less than 2 years of age in the west chamber of Tomb A 100. Curiously only the adult postcranial bones were present in the central bone pile.

Shaft Tomb A 101

This tomb was something of an anomaly during the field season. We were unable to clearly define the boundary of the shaft or the outline of the four entryways into the tomb chambers. The chambers also were not sharply demarcated. Indeed the clearest evidence for the existence of the tomb chambers was the few scraps of human bone and pottery found in the areas we have called chambers.

In the north chamber of A 101 the very fragmentary remains of a single adult were recovered. Similarly in the east chamber there were fragments of at least one adult skeleton. The south chamber contained skeletal parts of one adult and one child. Just inside the entryway of the southwest chamber we found the skull and long bones of a gazelle, but no human bone fragments were recovered from this chamber (see pp. 133-36).

Shaft Tomb A 86

Three skulls were arranged to the left of the southwest chamber of Tomb A 86, with the postcranial bones in a pile near the center. The skulls were in poor condition. Initial analysis of the postcranial material reveals the presence of parts of four adult skeletons and one child's skeleton (about ten years of age at the time of death). There are no remains of young children or infants. This is further evidence of the discrepancy between the number of skulls and the postcranial skeletons. The only explanation I can offer for this phenomenon arises from the poor condition of the skulls, which seem to have been in poor condition at the time of interment. It may be that the missing skulls had completely disintegrated before secondary burial. Clearly the skulls received special attention in the burial custom and would have been recovered if possible.

The southeast chamber of A 86 contained about 20 cm of silt, which covered most of the pottery and skeletal material, making recovery difficult. Skeletal parts of an adult male and an adult female had been placed in the tomb. There was no evidence of children or infants.

The entire northeast chamber of A 86 had been silted in. Field notes indicate the presence of four skulls, only two of which could be recovered. These fragmentary skulls are clearly adult. The age of the unrecovered skulls is unknown.

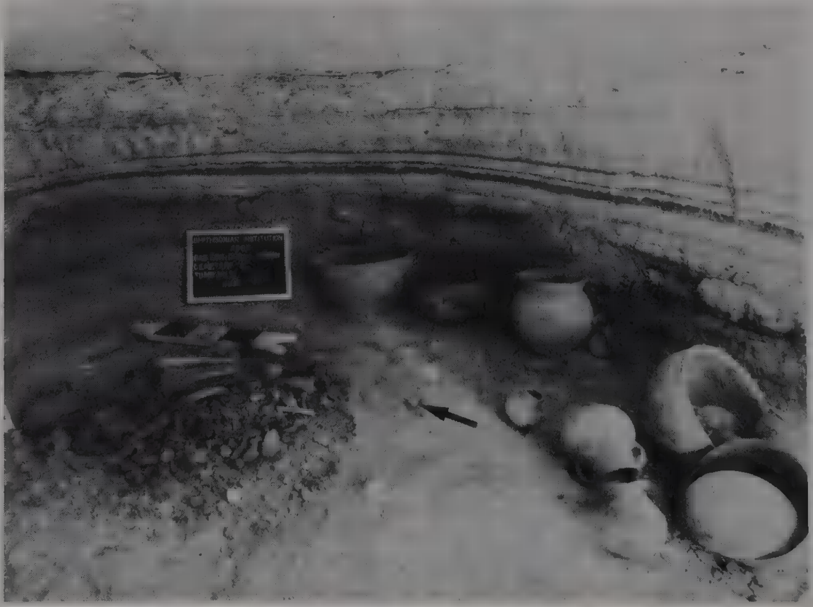
Shaft Tomb A 89

Nearby A 86 was Shaft Tomb A 89. The tomb complex included the shaft and three chambers all completely silted in. The skeletal material was in very poor condition and only very limited observations can be made on the fragments found in the northwest chamber. Portions of an adult skull and the skull of a child were identified. Subsequent analysis of the postcranial skeletal fragments in the laboratory indicated the presence of two adults and one child.

Shaft Tomb A 91

Shaft Tomb A 91 had only one chamber, located on the east side of the shaft. The skeletal

Fig. 5. The chamber of shaft Tomb A 91 showing a typical arrangement of tomb contents with skull fragments to the left of the postcranial bone pile and pottery to the right of the chamber. Peach pit (arrow) in situ is almost equidistant between the pottery and postcranial bone pile.



material was in poor condition, although the chamber had no silting and contained minimal roof fall. As is typical of the chambers where the placement of the skeletal material could be determined, the skull fragments were placed left of the postcranial bone pile located near the center of the chamber floor. The skeletal material included the bones of an adult and a subadult about 14-15 years of age.

Perhaps the most remarkable feature of this chamber was the presence of a peach pit located on the chamber floor about 20 cm to the right of the postcranial bone pile (fig. 5). Unless the pit itself can be dated, it will be difficult to establish conclusively that it was not intrusive. Two factors make this possibility unlikely, however. The first is that the tomb chamber was sealed at the time it was discovered, with no evidence that the seal had been disturbed. The second factor is that the soil beneath and somewhat peripheral to the pit is darker than the rest of the tomb floor (fig. 6). This suggests that the peach had been placed in the tomb and had rotted. Neither of these facts would preclude the pit or peach having been placed in the tomb at any time after the initial interment of the skeletal material and the final sealing of the tomb. However, this possibility seems unlikely.

Shaft Tomb A 120

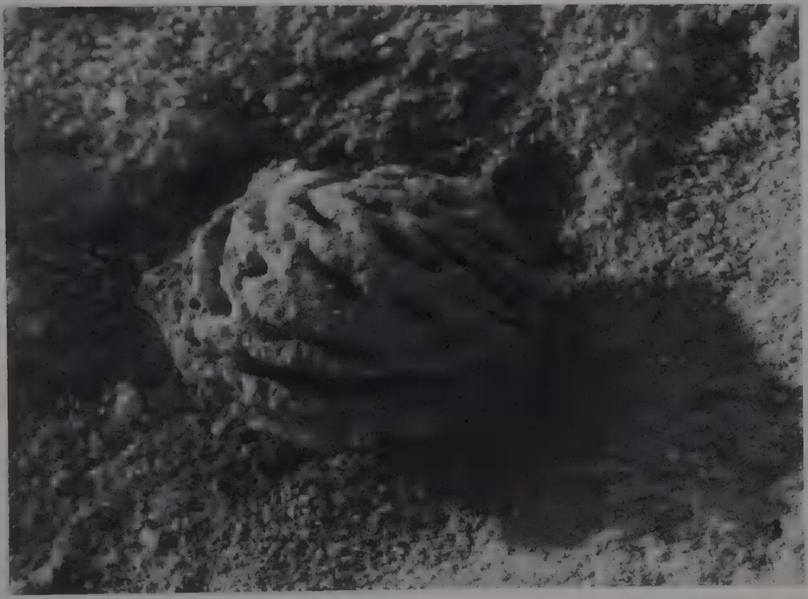
The chambers of Tomb A 120 had extensive silting and roof fall. The skeletal material was fragmentary and in poor condition. The skulls in the south chamber were arranged to the left of a central, postcranial bone pile. One individual was male, another female. The bones of the third were too incomplete to determine sex. One of the individuals was probably under 16 years of age; the others were fully adult. The north chamber of A 120 contained the remains of an adult male and female skeleton.

Shaft Tomb G 4

The single tomb chamber of G 4 had been completely silted in so it was excavated from the top. There were two unusual features associated with this tomb. First, major portions of the walls of both the shaft and chamber were lined with stones about 15 cm in diameter. Second, a test trench adjacent to the shaft on the side away from the chamber contained wooden poles which appeared to be buttressing the stone wall of the shaft. Associated with these short poles were the remains of an infant.

The chamber of G 4 contained at least three adults, one young adult and two children. One of the adult skulls appeared to be associated with articulated neck (cervical) vertebrae. Since the skeletal remains are secondary burials, the articulated vertebrae suggest burial of one body before complete decomposition had taken place.

Fig. 6. Detail of peach pit from shaft Tomb A 91. Notice the darker color of the soil in the area immediately around the pit. The darker soil is probably the result of decay products from the peach. The large darkened area to the right of the pit is shadow created by electronic flash. Within the shadow area the soil color difference is still distinguishable.



Shaft Tombs C 9 and C 10

About 150 m northwest of the G 4 shaft tomb, test trenches exposed a shaft tomb chamber (C 9) which had been completely silted in. The skulls of two adults and one child were placed to the left of a bone pile occupying the center of the chamber. Another shaft tomb contained a badly silted chamber (C 10 E) with at least three adults and a child. One of the fragments of an adult skull has the woven pattern of cloth imprinted on it indicating that the skull was covered with cloth at the time of burial. The west chamber of this tomb contained only a few small fragments of human bone.

The Human Remains from the EB IB Tombs

Shaft Tomb G 2

Tomb G 2 consisted of a shaft and a single chamber cut into the eastern wall of the shaft. There was considerable roof fall in the chamber which may have contributed to the generally poor preservation of the skeletal material. Badly broken skull fragments of an adult and a subadult were placed to the left of the central bone pile, which contained broken long bones, other postcranial bones, and three crudely made unfired clay pottery figurines.

Shaft Tomb A 100 N

The north chamber of A 100 differed from all of the other chambers excavated during the field season in having primary burials in the tomb. The major skeletal feature of the tomb was an adult male primary burial that dominted the central part of the chamber. The age of this individual was about 45 years and the estimated stature 165.3 cm (65 in). To the right of this skeleton were the skulls of two children, the youngest of which was about 4-5 years of age and the other about 6-7 years of age. The postcranial bones of these two children had been disturbed and scattered, with the lower limb bones to the left of the adult burial. This suggests that there were two episodes of burial represented by the skeletal material seen at the time we opened the tomb. The children presumably were put in earlier. The skeletal material is so complete that it seems likely that those children were put in as primary burials as well. However, the soft tissue decayed on the children to the point that, when the adult body was put in place, the bones of the children were disturbed and scattered as we found them when we opened the tomb. The adult burial was placed in the tomb with the lower limbs in a slightly flexed position, to accomodate the size of the chamber. The skeleton itself was oriented on the north-south axis, with the skull being on the southern portion of this axis. The skull was facing to the east, the hands placed near the face and superimposed on each other (fig. 7). Subsequent studies of the adult skeleton revealed two healed depressed lesions on the skull, probably the result of a blow. One was on the frontal bone near the front of the skull, the other on the right parietal bone. The teeth showed extensive build-up of calculus. The crown of the maxillary left second molar was severely decayed leaving the three roots separated by the decay process. The dentition was markedly worn with extensive exposure of pulp and accompanying deposition of secondary dentin. Skull No. 3, the older of the two children's skulls, had a marked erosive lesion of the sphenoid body on the base of the skull (fig. 8). The lesion was very well circumscribed suggesting a chronic condition. A tumor of the nasal passage is possible. Karl Rokitansky, a 19th-century pathologist in Vienna, indicated that tuberculosis affects the body of the sphenoid more often than any other bone of the skull (Rokitansky 1855: 175). The young age of the skeleton and the nature of the lesion support this diagnosis.

The tomb gifts in the north chamber of Tomb A 100 were almost exclusively arranged to the right of the chamber. Much of the pottery was nested. One fairly large jar (P 16, reg. no. 673) was sealed with a small shallow saucerlike vessel. Upon opening the jar it was apparent that there was residue on the sides and the bottom of the pot (fig. 9). The prospect that this could represent the dried remains of food was important since such gifts were not thought to occur in the EB tombs at Bab edh-Dhra (Lapp 1969: 22). Subsequent analysis of these dried residues revealed the proteinaceous nature of the material. We have compared the amino acid residues from the pot with known protein-containing substances including modern cow milk, goat milk, wine, and beer. Comparison of protein residues from these known substances with proteinaceous material in P 16 has not revealed any close relationship. It is instructive, however, to note that the closest relationship is with beer, which of course has a high grain content (Table 1). This suggests that the unknown proteinaceous material in P 16 may be grain-based, perhaps a cereal of some kind prepared as a food

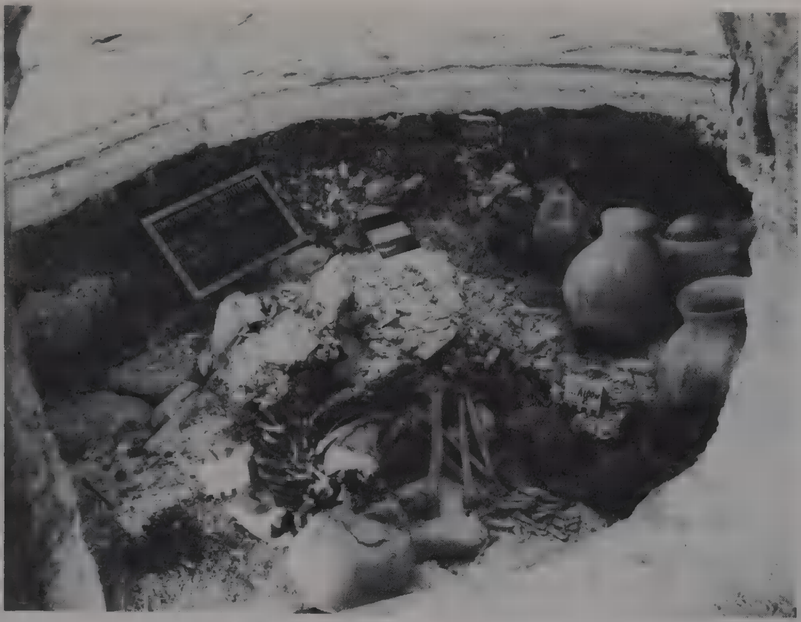
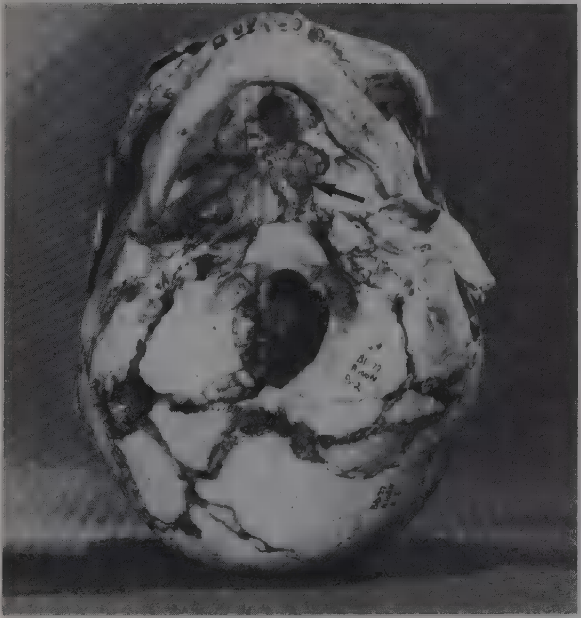


Fig. 7. The north chamber of shaft Tomb A 100 before removal of roof fall. The adult male primary burial is in the center of the chamber. The skulls and upper postcranial bones of two children are to the right of the chamber. Some of the lower postcranial bones of the children can be seen to the left of the chamber.

offering. One of the small pitchers (P 14, reg. no. 632) contained seeds from a grape. The combined evidence of protein residues in P 16 and the grape seeds in the small pitcher provide strong evidence for the inclusion of food gifts in the tomb chamber. Additional possible evidence of food was found in a bowl in the southwest chamber of A 78 in the form of bird bones, possibly from a partridge (see pp. 233-36).

Fig. 8. The skull base of a child between 6-7 years of age from the north chamber of Tomb A 100, showing a circumscribed destructive lesion of the sphenoid bone (arrow) thought to be the result of tuberculosis.



The fact that such gifts have not been noted previously may be partially attributed to poor preservation. It is important to emphasize that P 16 had been sealed at the time it was originally placed in the tomb chamber. Undoubtedly this procedure contributed to the preservation of the dried proteinaceous material.

Another unique feature of the north chamber of A 100 was the presence of a stone floor consisting of several large flat stones. After removal of the skeletal material and pottery, drawings were made of the stones after which they were removed. Several smaller bones of the hands and feet of two children were found in the cracks between the stones. Of considerable interest, however, was a small fragment of the anterior superior iliac spine of a fully adult innominate (hip bone) which was also found beneath the stone floor. This adult bone fragment does not fit with the adult innominate bones of the primary burial. While other possibilities cannot be eliminated, it would seem that the best explanation for the presence of this particular bone fragment in the tomb is that the tomb had been used previously, then had been almost completely cleaned out to provide space for

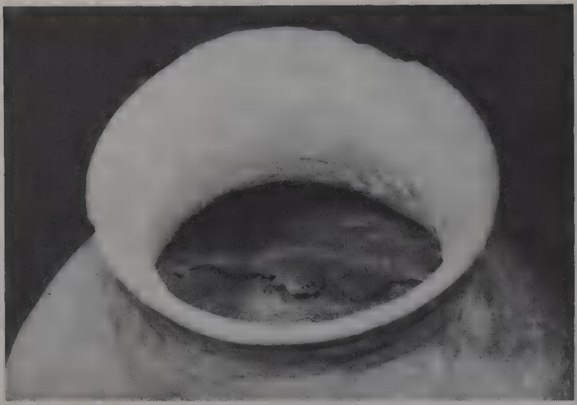


Fig. 9. Jar (registry no. 676) from the north chamber of shaft Tomb A 100 after removal of pottery seal. Proteinaceous residue is still adherent to the inside wall of the jar.

the bodies of the children and subsequently for the adult male burial. The possibility that the fragment might fit with one of the burials in the associated EB IA chambers of A 100 was also examined, but it does not belong to any of the known bones of these chambers either.

Just inside the entryway to the left were the fragments of the skull of what was probably a newborn infant. Again the implications of this skull remain obscure. Like most of the infant skeletons found in other tombs there were no postcranial bones associated with this skull. Numerous possibilities suggest themselves as an explanation. It is possible that the infant skeleton was placed in the tomb chamber during the initial use associated with the innominate fragment. When the skeletal material was removed the skull bones were left behind or replaced during interment of the children or adult bodies. The possibility of just the head of an infant being placed inside the tomb exists as well, but does not fit with evidence seen in many of the other chambers.

Shaft Tomb A 88

Three and one-half meters south of Tomb A 89 we exposed a burial group whose intrinsic relation-

Table 1. Amino Acid Residues from Unknown Proteinaceous Substance

Amino acids	A 100 N pot no. 16	Modern beer	Modern goat milk	Modern cow milk	Modern wine
Aspartic	184.41	76.58	77.91	87.73	60.79
Threonine	25.83	33.56	58.39	49.46	43.94
Serine	19.72	42.33	53.90	55.45	37.96
Glutamic	188.42	173.72	145.34	145.76	90.65
Glycine	128.30	118.38	37.33	41.15	82.67
Alanine	120.66	111.66	68.60	68.43	117.26
Cystine	--------	--------	--------	--------	--------
Valine	83.22	57.23	93.73	81.20	46.62
Methionine	16.04	1.81	25.61	28.50	--------
Isoleucine	55.74	29.48	55.93	61.62	32.16
Leucine	70.16	44.75	104.95	102.62	34.47
Tyrosine	8.24	9.83	28.19	32.62	7.51
Phenylalanine	31.16	27.97	43.17	44.82	15.91
Histodine	17.33	43.69	34.51	37.17	56.52
Hydroxylysine	10.69	--------	--------	--------	--------
Lysine	16.49	34.40	46.99	54.73	38.26
Arginine	4.57	29.78	13.01	16.79	39.54
Hydroxyproline	--------	--------	--------	--------	--------
Proline	17.76	110.51	112.48	91.97	295.74

Amino acid residues per thousand from unknown proteinaceous substance found in a sealed pot (Reg. no. 673) from the north chamber of Tomb A 100. This unknown is compared with the residues from modern beer, goat milk, cow milk, and wine.

ships were obscured by silting, erosion, and the possibility of multiple interment. Furthermore, it is not clear if these are part of the shaft tomb burial pattern although the pottery is in the EB I tradition. These burial groups were designated A 88, but they may have been related as part of a single burial complex. Only postcranial bones were recovered from the first bone cluster, including the bones of an adult and a subadult skeleton.

Elsewhere in this tomb complex we excavated a single extended primary burial of an adult female skeleton. Beneath the extended skeleton we found another burial cluster including a female skull. The postcranial fragments indicate the presence of two adults. Curiously some of the bone fragments including cranial and postcranial material have many small holes about 2 mm in diameter penetrating through the compact bone (fig. 10). These holes are certainly not an antemortem phenomenon. My impression is that they are on the bones of a single individual who was buried in conditions where boring organisms in the ground produced the holes. The fact that not all bones found in A 88 have this condition suggests that the boring occurred during primary burial and that the unaffected skeletons were not initially buried in the same location. Jones (1910: 290-91) found holes due to "beetle-eating" to be common in skeletal material excavated in Nubia. The holes he describes are very similar to those found in the skeleton from A 88.

Charnel House G 1

Careful study and analysis of the skeletal material from Charnel House G 1 has not yet been completed. Field observations indicate that most of the bones had been burned. Baby (1954) found that when dry bones are burned they tend to split in the longitudinal axis but do not become warped or deformed. Fresh bones and bone covered with soft tissue show transverse fractures and much warping (fig. 11). Generally the burned bones from G 1 had retained their normal anatomical shape. In some cases, however, the shape of the bones was

Fig. 10. Long bone fragments from Tomb Complex A 88 with postmortem holes. The cause of these holes has not yet been established, but insect larva or worms are probable agents.

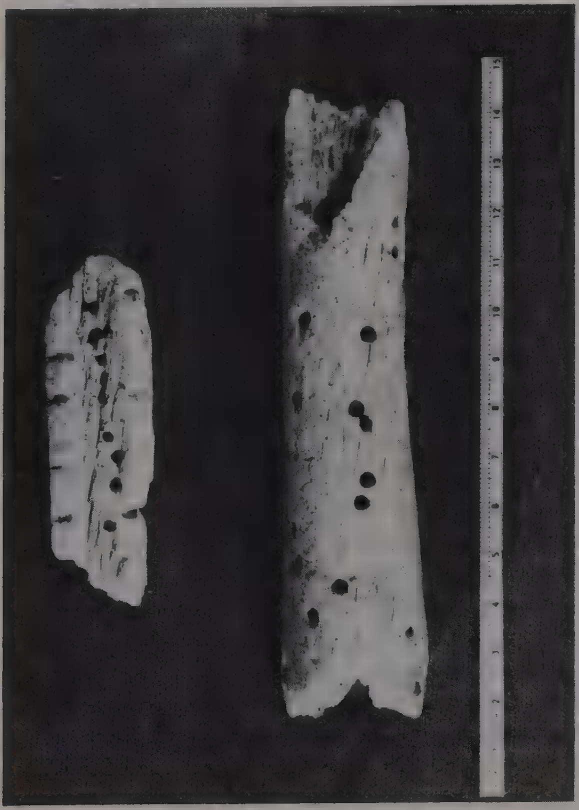
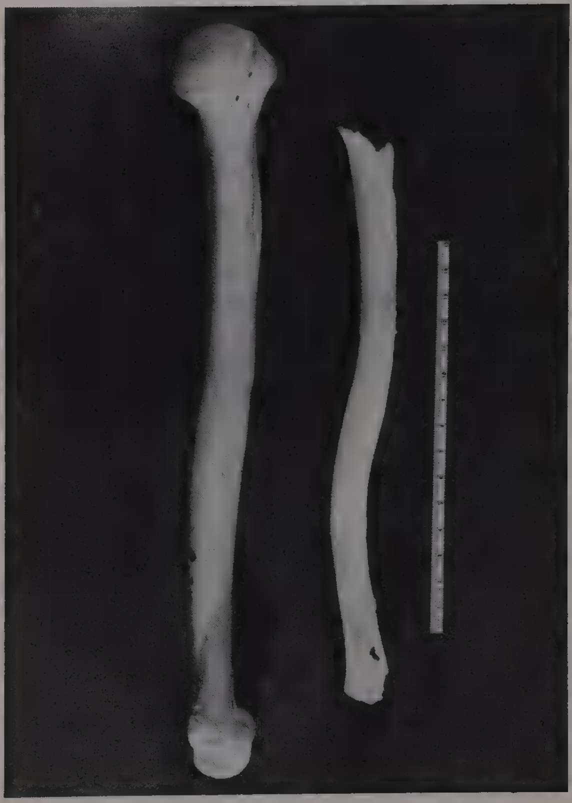


Fig. 11. A heat-deformed left humerus from Charnel House G 1 compared with a modern normal humerous (left specimen in figure).



deformed by the heat. This means that at the time of a fire in ancient times there would have been both dry skeletons and relatively fresh bodies in the charnel house. The possibility of intentional cremation cannot be eliminated, but the presence of undeformed burned bone in the charnel house would indicate that cremation, if conducted at all, was not performed on all bodies. The presence of the articulated bones of an arm (Burial 5) suggests that some burials were primary. The possibility of secondary burial remains problematical due to the disturbance of the burials.

The Human Remains from an EB II Tomb

Charnel House A 56

The skeletons in Charnel House A 56 were found on two levels. The field notes identify four adult burials, one subadult and one young child or infant associated with an adult burial on Level 1. The number on the second level is not clear due to complications induced by overlapping burials and poor preservation. It is clear, however, that most burials were at least partially articulated suggesting that primary burial was the typical pattern, perhaps with subsequent disturbance when additional bodies were placed in the charnel house.

Preliminary observations in the laboratory indicate a total of at least 10 individuals in the charnel house. Two of these were young children; no infants, however, were recovered. We found skeletons of both sexes in the charnel house. At least two of the skeletons have ages estimated in excess of fifty years. Some of the long bones appear to be more muscular than I have seen among the skeletal material from the EB I shaft tombs, but this must remain a tentative observation until I complete reconstruction and careful measurement of the respective skeletons.

Discussion

It is important to emphasize that many of the major problems I hope to clarify regarding the skeletal biology of the people of Bab edh-Dhra will have to await more complete reconstruction and analysis of the skeletal material. There are, however, some observations which can be made on the basis of the field and laboratory work conducted thus far.

Clearly, the shaft tomb burials point to a complex social practice which involved a significant investment of resources by the EB I peoples of Bab edh-Dhra. Our field experience indicates that reexcavation of the shaft takes one technical man working with two laborers about 20 hours of hard work. Cutting a tomb chamber would probably have taken about the same amount of time. The ancient tomb cutter of course would not have to sift the excavated soil, nor take time to carefully expose the original shaft wall. Even so, a conservative estimate of time it would take to prepare a typical tomb with a shaft and four chambers would be on the order of 15 man days of hard work.

To give some idea of the amount of time involved in preparing the necessary tombs for a year let us assume a population size of 5,000 people using the cemetery. If we take a typical annual death rate (crude mortality rate) of 45 individuals per 1,000 population, this means that tombs would be needed for 225 bodies per year. With an average of 12 bodies per tomb this means that 19 new tombs would have to be prepared each year. The latter would require 285 man days of activity per year to carve the necessary tomb chambers. When one adds the time and economic resources involved in preparing the tomb gifts, one gets a further perspective on the importance of this burial custom.

The natural resources available to the ancient tomb makers included fairly well-consolidated sand and gravel in most areas of the cemetery. However, the most important resource was the spotty but common occurrence of fairly thick (ca. 1 m) layers of Lisan marl. Typically, locations of this material would be sought for the preparation of tombs. The existence of the marl layer would be apparent when the shaft was dug, and appropriate consideration given to its position when the chamber was excavated so that the marl formed the roof and was sufficiently thick over the roof to prevent collapse. The absence of marl layers in some apparently incompleted shafts may explain why further excavations were abandoned.

An interesting question is why some tomb chambers are silted in and others not. Clearly the presence of one or more blocking stones is a significant variable. Another factor is the possibility that not all shafts were backfilled after some or all of the chambers were used. Erosion, during the rainy season, would wash into the shaft and into the chamber if there were no blocking stones or if the blocking stones could not resist the weight of the water and soil.

Lapp's (1968: 22) earlier argument that food gifts were not placed in the shaft tombs is not supported by our findings in 1977. There is no doubt that the proteinaceous material found in a sealed pot in A 100 N was food. The presence of grape seeds in the same tomb chamber further supports this conclusion. A bowl in the southwest chamber of A 78 also contained bones of a partridgelike bird which might have been part of a stew. This does not mean that all pottery contained food offerings. Lapp's opinion that the nesting of pottery in the chambers argues against their use as food containers may still be valid for such pottery.

The evidence provided by the north chamber of A 100 suggests that some tombs may have been cleaned out and reused many decades after initial use. The condition of the other chambers of this tomb argue against the shaft being left unfilled during the interim. This would suggest that the people of Bab edh-Dhra knew where the shafts were and could reopen the tomb. This is not surprising in view of the evidence in Tomb A 78. In this tomb the unstratified nature of most of the shaft backfill argues for intentional backfill rather than natural erosion. Some settling of the fill occurred, however, and created a depression which was gradually filled by natural erosion into the depression. The ancient people of Bab edh-Dhra would surely have recognized the significance of these depressions in the cemetery areas as indicators of shaft tombs.

Multiple episodes of shaft excavation, burial, and shaft backfill are possible, raising the question of whether the secondary burials were all placed in the tomb chambers at the same time. Except for the evidence of at least 3 burial events in A 100 N, the secondary burials all seem to be intermingled in a way suggesting interment of all individuals at the same time.

With the exception of the north chamber of Tomb A 100, all burials in the shaft tombs were secondary. This, of course, means additional effort for the temporary primary disposal of the body. In view of the clay and sand deposits found on many of the skeletons in clean burial chambers, burial in the ground would appear to be the probable form of primary burial.

The field evidence indicates that the EB IB charnel house and particularly the EB II charnel house burials were primary. There are disturbed burials in the charnel houses which could be attributed to secondary burial practices but this appears to be the result of disturbance of older burials as more recent bodies were placed in the charnel house.

At this stage of the research I can offer only a few generalizations about the skeletal biology of the people of Bab edh-Dhra. We excavated a minimum of 92 individuals from the EB IA shaft tombs. Fifty-six (61%) of these individuals were adults 18 years of age or older, 36 (39%) were subadult. A very similar relationship between adult and subadult skeletons is found at the EB cemetery of Karatas in Turkey. Angel (1976: 389) reports on a skeletal sample of 584 individuals in which 33% were subadults and 67% were adults. He uses a somewhat lower age limit (14 years) for the subadult age range than is used in this report. This may partially explain the lower percentage of subadults in the Karatas sample.

Table 2. Mortality of adults and subadults from the EB IA shaft tomb burials at Bab edh-Dhra, Jordan

	Number of Individuals	Percentage of Total
Adult Skeletons (18 years and older)	56	61%
Subadult Skeletons (1-18 years of age)	28	30%
Infant (Birth to 1 year)	8	9%

Angel's study of MB skeletons from Lerna, Greece (1971: 70) suggests a much higher infant mortality than we found in the shaft tomb burials at Bab edh-Dhra. Comparisons of infant mortality are difficult unless one can be certain that most infant skeletons are buried in the cemetery at the time of death and were recovered at the time of excavation. Assuming that the differences in infant mortality reflect real conditions it could be that the less sedentary EB IA people of Bab edh-Dhra had less exposure to endemic infectious diseases prevalent in the later, more sedentary, urban life.

In spite of the high subadult mortality it is clear that many of the adults lived beyond 50 years. There is little evidence of disease in the skeletons. This is not surprising since most diseases do not affect the skeleton. The possible cases of tuberculosis are certainly some of the earliest examples of this disease. Derry (1938: 198) suggests the existence of tuberculosis in ancient Egypt as early as 3300 B.C. The most unequivocal example, however, is reported by Smith and Ruffer (1910) in an Egyptian mummy dated about 1000 B.C. The teeth in the skeletons from Bab edh-Dhra are worn, suggesting a coarse diet, but evidence of dental decay is slight. There was extensive and common build-up of calculus on the teeth. This may have led to periodontal disease but evidence of this is slight. None of the skeletons are tall. The tallest male studied thus far is 175 cm, the tallest female about 157 cm.

Conclusion

The cemetery excavations during the field season of 1977 have provided the human skeletal remains which will permit us to begin the process of partially reconstructing the biological history of this significant group of people. Additional reconstruction and data collection and, indeed, more skeletons will be necessary before the relationship of the people in the various cultural subphases at Bab edh-Dhra is known. Further work is also necessary on the cultural practices, and time involved in the primary and secondary burial phases in EB IA. The curious lack of congruence between the number of individuals represented by skulls in contrast with postcranial bones needs clarification. The extent to which skeletal material from different individuals was placed in the tombs at the same time has considerable significance for our understanding of the cultural practices associated with the shaft tomb burials. Clearly the possibility of highly significant biological and cultural data about the people of Bab edh-Dhra is great, and I would welcome the criticism, suggestions, and advice of colleagues as the work continues.

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Animal Remains from the Bab edh-Dhra Cemetery

BRIAN HESSE and PAULA WAPNISH

Introduction

The 1977 excavations at Bab edh-Dhra cemetery encountered animal bones in association with Tombs A 78 SW and A 101 SW. The context of the first association suggests offerings of food, the second a possible gazelle sacrifice.

Tomb A 78 SW

P 18 of this tomb contained two left wing bones from a chukar partridge, *Alectoris graeca*, a resident of open stony desert (Nelson 1974), and the partial skeleton of a small lizard. P 19 from the tomb also contained lizard remains. Table 1 is a listing of this material. The chukar bones are also illustrated in fig. 1. Other pots from the cemetery tombs have been found to contain food remains—grapes, for instance—and it seems likely that these animal remains represent a similar intention.

Tomb A 101 SW

A partial skeleton of a gazelle was found at the entry leading to tomb chamber A 101 SW. Table 2 lists the skeletal elements preserved. Figure 2 illustrates some of them. Three forms of gazelles are known from the eastern Mediterranean region: *Gazella gazella*, the mountain gazelle; *G. dorcas*, the Dorcas gazelle; and *G. subgutturosa*, the goitered or Persian gazelle (Atallah 1978; Harrison 1968; Mendelssohn 1974). While the goitered gazelle is the largest form and the Dorcas the smallest, there is considerable size overlap, and it is difficult to separate them on the basis of measurements (Ducos 1975). However, the Bab edh-Dhra material agrees with the high end of the size range described by Ducos for the Mureybit material. Since this sample contains all three species, the correspondence suggests that the Bab edh-Dhra specimen is either *G. gazella* or *G. subgutturosa*. The horn cores of our specimen are widely spaced at the base and not lyrate in form, characteristics which Harrison identifies with *G. gazella*. Since female mountain gazelle horns are very much smaller than those of the males, our specimen is provisionally identified as a *Gazella gazella* male.

Two observations suggest that the association of gazelle and tomb is not accidental—i.e., that the animal fell into the unfilled tomb shaft and was unable to escape. First is the absence of the remains of trapped animals in other tombs at Bab edh-Dhra. Tomb shafts left open for long periods could well have acted as traps. Abandoned test pits at archeological sites, roughly analogous to the tomb shafts, have, in our experience, often trapped small mammals and reptiles. The lack of these in the cemetery shafts is thus negative evidence, which suggests that some of the shafts were deliberately filled soon after the burial chambers were filled.

The second, stronger argument derives from a consideration of the parts of the gazelle skeleton which were recovered. Present are the head and mandibles, the spinal column, the sacrum, the ribcage, the sternum, the left foreleg, and the right hindleg. Absent are the bulk of the phalanges (all of the PH-IIs and PH-IIIs), the patellae, the caudal vertebrae, the carpals, the right foreleg, the left hindleg, and the innominate. The consistency

Table 1. Animal Bones in A 78 SW

Pot 18.			
Alectoris graeca			
	1	left coracoid	Greatest length = 38.6 mm.
	1	left ulna	
Partial lizard skeleton			
	8	long bone fragments	
	19	vertebrae	
	8	ribs	
	2	phalanges	
Pot 19.			
Small lizard			
	2	long bone fragments	

of the pattern argues against the possibility that the missing bones are the result of differential preservation. The pattern, however, would be produced by skinning the animal, thus removing the caudal vertebrae and phalanges, and cutting two limbs from the carcass.

Animal sacrifice was a common element in the ancient Near East. Bodenheimer (1960: 203) writes, "sacrifices of domestic, and to a lesser degree, of game animals were a very common usage of all the Semitic Middle East since the third millenium B.C." Evidence that gazelles were used for sacrifice comes from a text listed under the entry for *ṣabītu* in *The Assyrian Dictionary*: "I am approaching you carrying as an offering a pure gazelle kid, born of a gazelle" (Oppenheim 1962: 43). Also, gazelles could symbolize deities. Albright (1926) mentions that Sumukan, patron of animal husbandry, could appear as a gazelle.

Ceremonial meals associated with funeral rites also are attested in the ancient Near East. "Amorite texts of the 18th century B.C. mention the funeral meal (*ukkulum*) beside the wake (*maṣṣartum*) and the lament (*naḫādum*) as standard rites of mourning" (Gaster 1969: 603). Gaster also writes (1969: 604) "sometimes, to be sure, the custom of 'eating

Fig. 1. Chukar partridge wing bones found in P 18 of Tomb A 78. See Table 1.

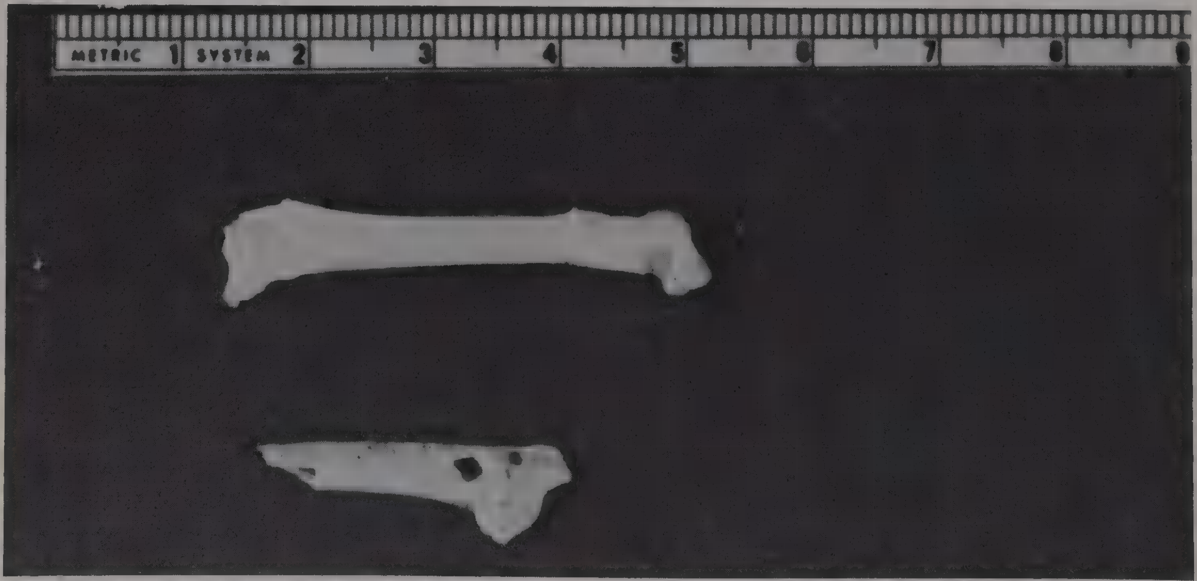

Table 2. Gazelle skeleton in A 101 SW

Crania - Fragmented but essentially complete - both horn cores.

Mandibles - Fragmented but essentially complete
Length of M3 (left) = 17.4 mm.
(right) = 17.4 mm.

Spinal Column
Cervical - 6 + 1 atlas and 1 axis
Thoracic - 9
Lumbar - 4
Sacrum - 1
Caudal - 1

Ribcage
Proximal ribs
10 left
11 right
Rib fragments - 54
Cartilage fragments - 27
Sternum - 5

Left Scapula - Length of glenoid fossa = 23.4 mm.
Left Humerus - distal trochlear width = 25.9 mm.
Left Radius - Proximal trochlear width = 26.8 mm.; distal width = 24.5 mm.
Left Metacarpal - Distal width = 20.5 mm.; Proximal width = 21.4 mm.
Right Femur - Distal width = 36.2 mm.
Right Tibia
Right Calcaneus
Right Astragalus - Distal width = 17.1 mm.
Right Metatarsal

Anterior Phalange I - Greatest length 44.0 mm.
Posterior Phalange I (2 specimens) - Greatest lengths = 40.5, 40.6 mm.

Right Horn Core - Greatest length along anterior surface = 144.0 mm.
Left Horn Core = 151.0 mm.

with the dead' was regarded in Israel as a heathen rite, evidently smacking of ancestor worship." On this basis it can be suggested that animal sacrifice and the consumption of part of the slaughtered animal would be a part of the funerary traditions of the ancient Mediterranean region, and that the Bab edh-Dhra skeleton might be an early example of it.

A parallel to the Bab edh-Dhra gazelle-tomb association (though much later) has been reported from Tell El-Ajjul (Tufnell 1975, particularly the picture on p. 57). Bodenheimer (1960: 184) writes, "in tomb no. 101 four asses were sacrificed and placed at a rather higher level than the human burial. A leg of an ass was dissevered. A fine horse burial had only one leg *in situ*, three legs had been removed, the hindlegs by chopping away the sides of the pelvis. Was there a regular habit to remove some of the legs?" In addition to this another tomb area contained quantities of severed animal limbs in a ceremonial context. While this Tell El-Ajjul burial has often been described as Hyskos in origin, Moorey (1975) notes that it might be a product "of the much wider Canaanite civilization." The Gazelle in Tomb A 101 SW at Bab edh-Dhra may be a part of that tradition.

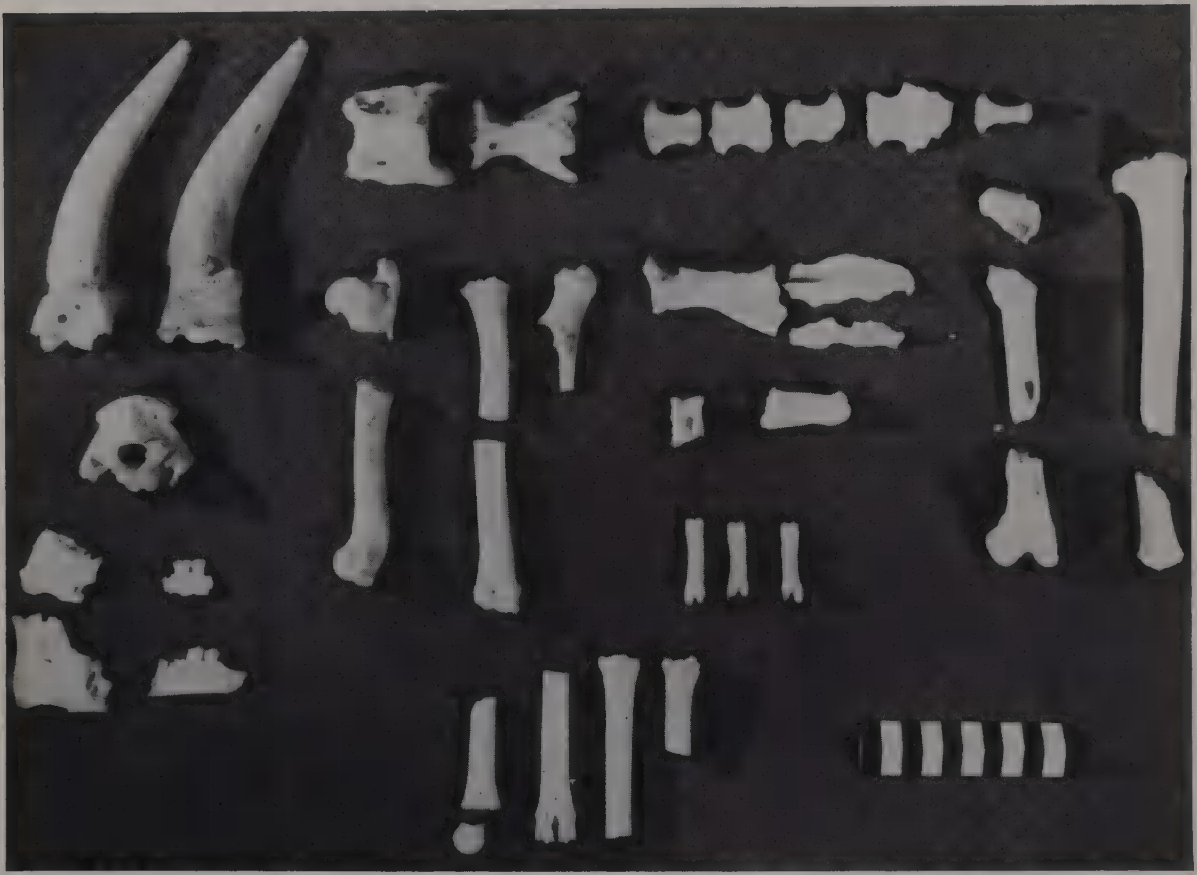

Fig. 2. Skeletal remains of gazelle found in entryway to chamber of Tomb A 101 SW. See Table 2.

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Part Three: Environment and Region

Geologic Investigations at Early Bronze Sites

Jack Donahue

Introduction

Purpose

The purpose of this paper is to report tentative conclusions derived from a three-week (25 May-15 June) field season in conjunction with the Southeast Dead Sea Archeological Expedition. As geologist for the expedition, I am concerned primarily with two aspects: synthesis of a regional geologic setting for the southern Dead Sea valley, especially with regard to the EB sites located there, and specific geologic interpretations at the five EB localities (fig. 1).

The regional synthesis I present here is derived mainly from the literature supplemented by personal field observations. I am not attempting a comprehensive geologic report but rather am drawing only on those aspects of the geologic picture which bear directly on the archeology. The specific geologic interpretation is limited to the northernmost site, Bab edh-Dhra. The three southern sites are within a militarily restricted zone and were only visited two times. Numeira, the site south of Bab edh-Dhra, although being excavated, was also only visited a limited number of times. The expedition was concentrated on Bab edh-Dhra and thus my major effort centered there.

Previous work

A number of comprehensive geologic studies are available for the Dead Sea area. The Dead Sea itself as well as the preceding Late Pleistocene Lake Lisan are reported on by Neev and Emery (1967); Begin, Ehrlich, and Nathan (1974); and Neev and Hall (1977) among others. The salt and associated deposits in the Dead Sea are covered in a number of papers (Zak 1969; 1974; and Zak, Karcz, and Key 1968).

Regional geologic studies and geologic maps for the Dead Sea area and Jordan have been produced by Quennell (1951; 1956; 1958), Burdon (1959), and most recently by Bender (1968a; 1968b; 1969; 1974; 1975). Geology west of the Dead Sea can be found in a number of publications (Bentor and Vroman 1960; Picard 1943; 1965).

Geologic History

A brief sketch of the geologic history of the Dead Sea area is helpful before I discuss details of the geology for the EB sites. The history for the region, although complex if examined in detail, can be divided into three major phases.

The oldest exposures in the area are Pre-Cambrian (older than 600 million years B.P.; B.P. means before present) igneous and metamorphic rock sequences within the Arabian Shield. They represent a period of mountain building associated with igneous activity. Topographic relief established during the Pre-Cambrian was largely eroded and removed before the end of that period. Thus, by the close of Pre-Cambrian time, the Arabian Shield, a low relief feature, was established (Bender 1974).

The second phase of history involves deposition of sedimentary rocks upon the Arabian Shield. The period of time involved is Cambrian (500-600

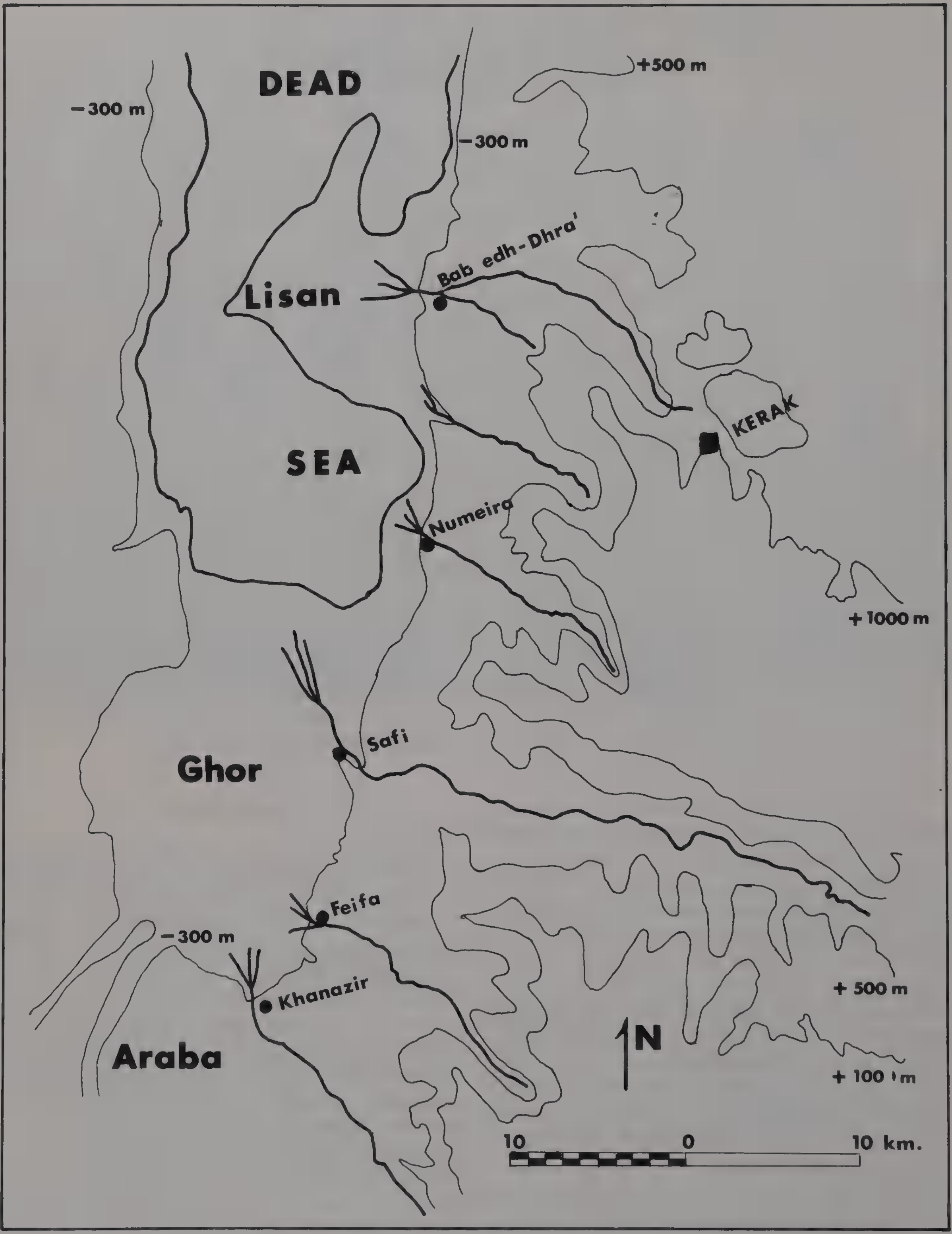


Fig. 1. Location of the five EB sites along the southeast margin of the Dead Sea valley. The area between the -300 m and 500 m contour consists largely of alluvial fan deposits.

million years B.P.) through at least Eocene (38-55 million years B.P.). The area west and northwest of the present Dead Sea tended to be a site for marine sediments while terrestrial deposits were more common to the east and southeast (Bender 1975: 110). The Lower Paleozoic (345-600 million years B.P.) sedimentary rocks tend to be terrestrial reddish sandstones which have commonly been described as Nubian Sandstone (Burdon 1959). The Middle Paleozoic through Upper Mesozoic (66-345 million years B.P.) rocks show a change to light colored fine-grained sandstone and fine-grained limestones which can be fossilferous and/or cherty. These units commonly thicken toward the northeast; subsidence increased in that direction which was toward the Tethys geosyncline. The region to the southeast tended to remain a stable shelf, the Arabian Shield (Bender 1975).

In Oligocene (22.5-38 million years B.P.) or Miocene (6-22.5 million years B.P.) time, a radical change in tectonic style occurred. The Dead Sea-Jordan River rift valley developed; the center of this long narrow valley, extending from north of Lake Tiberias to the Gulf of Aqaba and the Red Sea, is a downdropped fault block or graben. Major movement on the fault has been strike-slip or horizontal but enough vertical displacement has occurred to form the rift. The high-standing escarpments to the east and west are erosional remnants of the upthrown fault blocks. Sporadic earthquakes within the Dead Sea area indicate that fault movement is still taking place.

During Miocene and Pliocene (1.9-6 million years B.P.) time, a seaway connection apparently existed with the Mediterranean (Neev and Emery 1967) and perhaps the Red Sea. Marine limestones and evaporites were deposited along the central axis of the Dead Sea rift while conglomerates and sandstones were emplaced along the east and west border of the rift valley; alluvial fan deposits accumulated from the adjacent high-standing escarpments. Before Pleistocene (12 thousand-1.9 million years B.P.) time, seaway connections were terminated but because of the predominantly arid climate in the region, evaporite deposition continued from fresh water. Alluvial fan sedimentation continues up to the present time along the margins of the rift.

Several deep wells (4000 m) have been drilled into the rift sedimentary sequences, but it was not possible to drill through the complete fill in the graben. Seismic methods have been used to estimate the thickness of the rift deposits. Nettleton (1948; 1958) estimated that the Dead Sea rift was filled with sediments to a depth of 3-6 km. Zak and Bentor (1972) using somehat different assumptions, recalculated data from Nettleton (1958) and Nasr (1949) and estimated that the sedimentary fill reaches a depth of possibly 8-10 km.

The final sequence of events for the rift valley has involved the shrinkage of Lake Lisan, which filled a large portion of the valley from the Araba escarpment, south of the Dead Sea, to north of Lake Tiberias. The lake was present from about 60,000 years B.P. to 18,000 years B.P. (Begin, Erlich and Nathan 1974). Since that time, the shoreline has apparently retreated to the present position of the Dead Sea.

Geologic structure and especially the location of faults strongly control present topography within the southern Dead Sea valley. Figure 2, (after Neev and Emery 1967) shows one interpretation of faulting within the rift zone. The prominent north-south faults are along the border of the rift zone and have been active since perhaps Late Cretaceous (ca. 80 million years B.P.). The earlier movement is apparently predominantly strike-slip; pronounced vertical movement did not occur until Late Pliocene (ca. 2.5 million years B.P.) time (Neev and Emery 1967: 21) when a thick sequence of sediments, evaporites in the center of the rift and sand and gravel on the margins, began to accumulate. Bender (1974; 1975: 120) places the first significant vertical movement somewhat earlier, Oligocene to Miocene, with deposition of syntectonic, mildly deformed, sedimentary rocks within the rift. Bender (1975: 121) also states that evaporite deposition apparently began in Miocene time; seismic records indicate an evaporite sequence at a depth of 4000 m.

Although the data are not unequivocal, Neev and Emery (1967) suggest the presence of northwest trending faults on the north, east, and south borders of the north and south basin of the Dead Sea (fig. 2). The Lisan Peninsula is interpreted as a high-standing horst structure. The Araba escarpment, 15 km south of the Dead Sea, was formed by movement of the southernmost fault, a feature which is well documented from field evidence. Movement on these faults is thought to have occurred in Holocene time (less than 12,000 years B.P.), after deposition of the Late Pleistocene Lisan

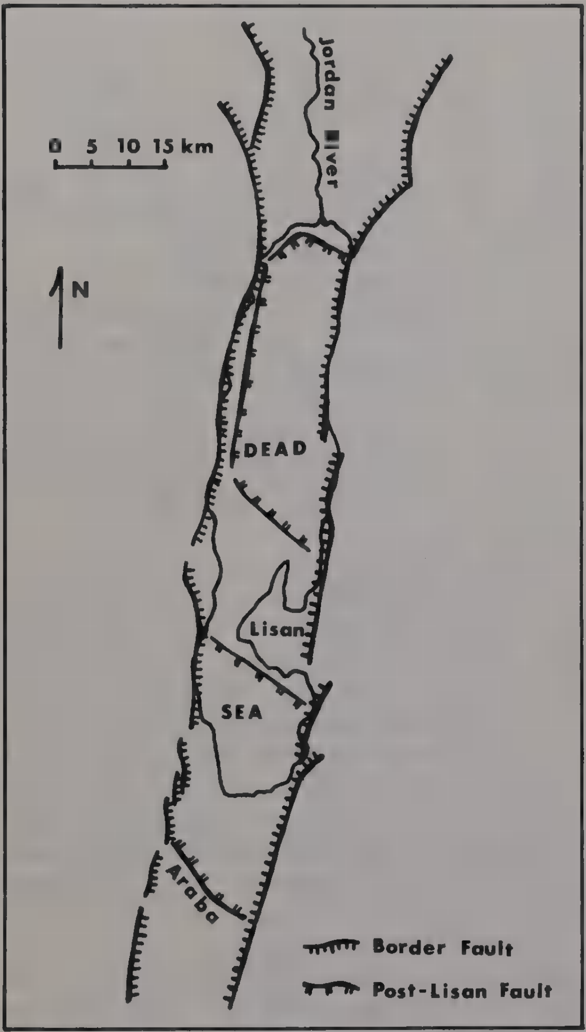


Fig. 2. Fault positions around the Dead Sea. Border faults mark the east and west edge of the Dead Sea-Jordan River graben. Post-Lisan faults mark the boundaries of the down-dropped blocks of the north and south basin for the Dead Sea. After Neev and Emery, 1967.

Formation. If the interpretation is correct, the Dead Sea is a structurally controlled depression which formed in the last 18,000 years.

The placement of wadi systems, presently eroding into the eastern escarpment, may also be fault controlled Bender (1975) shows large fault traces in the position of Wadis Kerak, edh-Dhra, and Hasa. Shorter fault traces are also indicated in the position of Wadi Khanazir. No faults are located near Wadis Numeira or Feifa, but these may have been missed during fieldwork for preparation of the geologic map. It is reasonable that the present wadis would be located along fault zones; the faults provide a zone of weakness which would be preferentially eroded.

Regional Setting of the EB Sites

All five EB sites are located on alluvial terraces east and southeast of the Dead Sea (fig. 1). In all cases, the sites are situated immediately adjacent to major wadis which drain the 1000-m-high rift escarpment immediately to the east. The terrace is an erosional remnant of an alluvial fan complex; silts, sands, and gravels were transported from the eastern rift escarpment and deposited as coalescing fans.

The three southern sites, Safi, Feifa, and Khanazir, were only visited twice and, at this point, I am only prepared to compare them in differences in boulder composition. The boulders on the alluvial fans are used in wall construction at all five EB sites, and there are distinct differences among the sites. The differences are definitely related to the upland geologic terrain eroded by the wadis adjacent to each site.

A number of rock types are common to all five EB sites. Light to brownish, fine-grained calcareous sandstones are probably derived from Paleozoic to Lower Mesozoic units in the upland sequence. A variety of light colored fossiliferous and/or fine-grained limestones are quite common and are derived from Cretaceous units in the uplands (Bender 1975). Light colored to black chert fragments, either by themselves or contained within a limestone are common to all sites and represent cherty limestone facies from the Cretaceous sequence.

The reddish "Nubian" sandstone (Burdon 1959) is not found at Bab edh-Dhra. This is quite expectable since the Cambrian "Nubian" sandstone is not exposed near Wadi Kerak (geologic map in Bender 1975) and, thus, not eroded and transported to the alluvial fan at Bab edh-Dhra. Basalt fragments are relatively uncommon at Numeira and again, this is to be expected since there are no basalt outcrops upland from this site. Basalt outcrops are present within the drainage of the other four wadis. Finally, several igneous boulders were found at Safi. Examination of the geologic map (Bender 1975) shows one small patch of Pre-Cambrian igneous rock within the drainage of Wadi Hasa.

All the above rock fragments tend to be well-rounded with the exception of the "Nubian" sandstone which has a more tabular shape. Short transport down the wadi systems, a distance of 20-30 km, is apparently a very effective rounding mechanism. The "Nubian" type sandstones were transported a much shorter distance and have suffered far less erosion.

Another rock type, found mainly at Bab edh-Dhra and Safi, consists of wadi sands and gravels cemented by calcium carbonate. The rock generally has a flat tabular shape when found loose at the sites. The sediment was cemented in place within the alluvial fan and has not been transported or weathered. Most of this material was probably quarried by humans and used as a construction material.

Natural Stratigraphy at Bab edh-Dhra

A number of stratigraphic units are exposed within the immediate vicinity of Bab edh-Dhra, and some are important as construction materials for the site. They range in age from possibly the Oligocene up to the Upper Pleistocene. These units were examined during fieldwork at the site and are as follows:

Syntectonic units

Bender (1975) describes a number of syntectonic units from the Dead Sea rift valley; sedimentary rocks which were mildly deformed contemporaneously with deposition and fault movement during development of the rift. They range in age from Oligocene to Miocene (Wetzel and Morton 1959: 167).

Four different lithologies are presently exposed along the floor of the Wadi Kerak; different lithologies are exposed at Wadi Haditha, just north of Wadi Kerak. The syntectonic units in Wadi Kerak are gently folded with dips reaching a maximum of about 30°. Minor faults with small displacements are also present. No effort was made to measure thicknesses within these units as they probably were not exposed at the time of occupation at Bab edh-Dhra; they are not found in the cultural materials at the site.

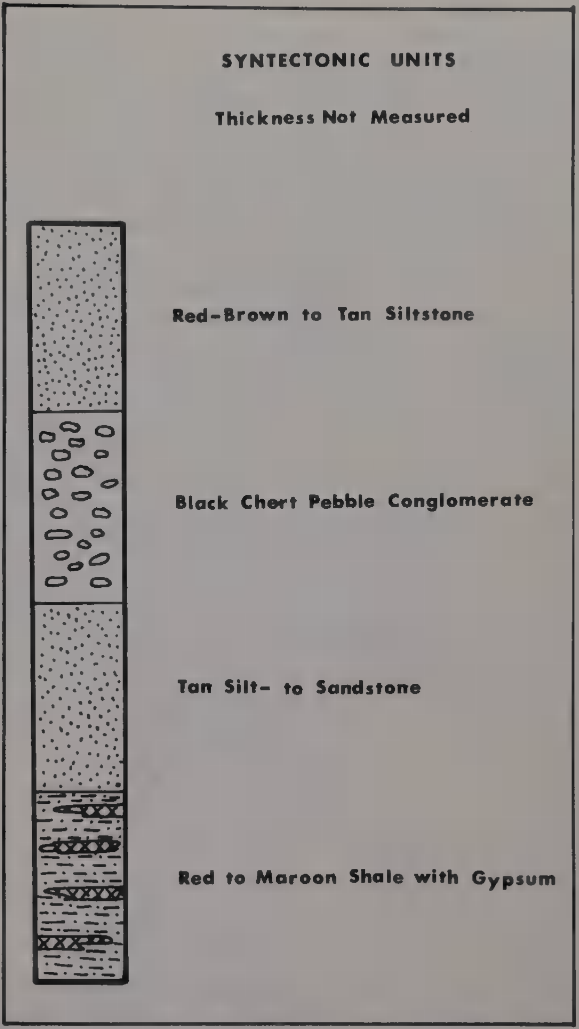

SYNTECTONIC UNITS
Thickness Not Measured
Red-Brown to Tan Siltstone
Black Chert Pebble Conglomerate
Tan Silt- to Sandstone
Red to Maroon Shale with Gypsum

Fig. 3. Stratigraphic section for syntectonic units observed in the Wadi Kerak. Thicknesses were not measured for the four units.

Figure 3 diagrammatically illustrates the lithology and stratigraphic sequence for the syntectonic units. The basal unit, exposed upstream from Bab edh-Dhra, is a red to maroon shale containing abundant gypsum. The gypsum contains numerous small fractures reflecting the tectonic stress the unit was exposed to during rifting.

Overlying the gypsiferous shale is a tan silt-to-sandstone, also mildly deformed. The contact between the shale and silt-to-sandstone was not observed; it is not known whether a conformable relationship exists.

The black chert pebble conglomerate, overlying the tan silt-to-sandstone consists of 4-8-cm black, well-rounded chert pebbles within a silt- to sand-

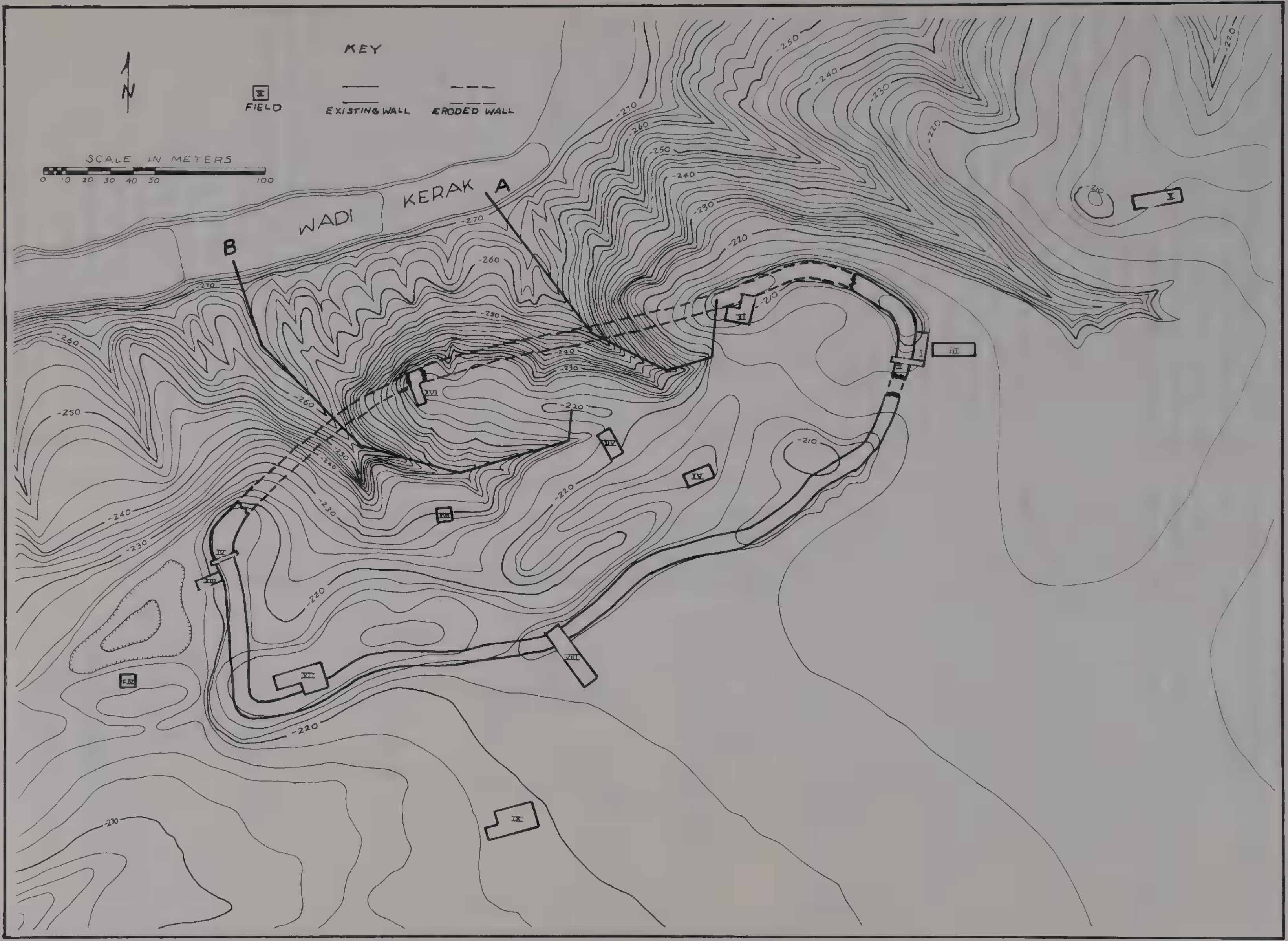


Fig. 4. Topographic map of Bab edh-Dhra. Location of stone wall, fields (archaeological excavation) and stratigraphic sections A and B indicated. After topographic map prepared by Jeffrey A. Raday.

sized, buff to tan matrix. The chert pebbles contain micro-release fractures with a parallel orientation; the surrounding matrix is not affected. Contact relations with the super- and subjacent units are not exposed.

The uppermost unit is exposed along the wadi floor immediately beneath Bab edh-Dhra. It consists of a well-cemented, reddish-brown to tan siltstone which again is gently deformed. It has an unconformable, angular relationship with the overlying Pliocene to Pleistocene gravels.

The upper boundary of the syntectonic units is an eroded surface having an irregular relief; this surface may be responsible for the spring presently located near the wadi floor immediately below Bab edh-Dhra. At the spring itself, the contact between the syntectonic units and the overlying gravels is obscured by travertine deposits and vegetation. It probably is less than 10 m above the wadi floor. In a downstream direction, 100 m west of the spring, the contact is at a height of about 15 m (fig. 5). An additional 100 m west, the contact has risen to a height of 25 m (fig. 6). The syntectonic units are fine-grained and relatively impermeable, while the overlying gravels are coarse and permeable and would serve as a good aquifer. The spring located immediately beneath Bab edh-Dhra as well as the spring located in Wadi edh-Dhra, a tributary of Wadi Kerak located 100 m northeast of Bab edh-Dhra, are caused by emergence of ground water flowing through gravels from the uplands to the east. Their emergence is probably caused by the rise in the syntectonic erosional surface at this point.

The syntectonic units were deposited during initial downfaulting and development of the rift

Fig. 5. Stratigraphic section measured from Wadi Kerak floor up tributary into Bab edh-Dhra. For location, see fig. 4. Tan, calcareous sand and silt beneath Lisan Marl represents an overlay of younger sediment "plastered" on tributary wall and is actually younger than Lisan Marl.

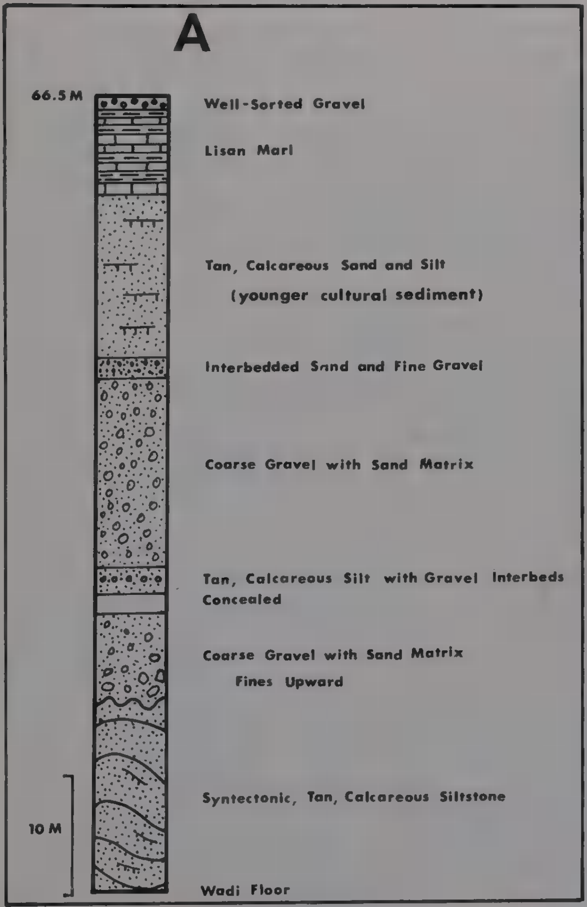
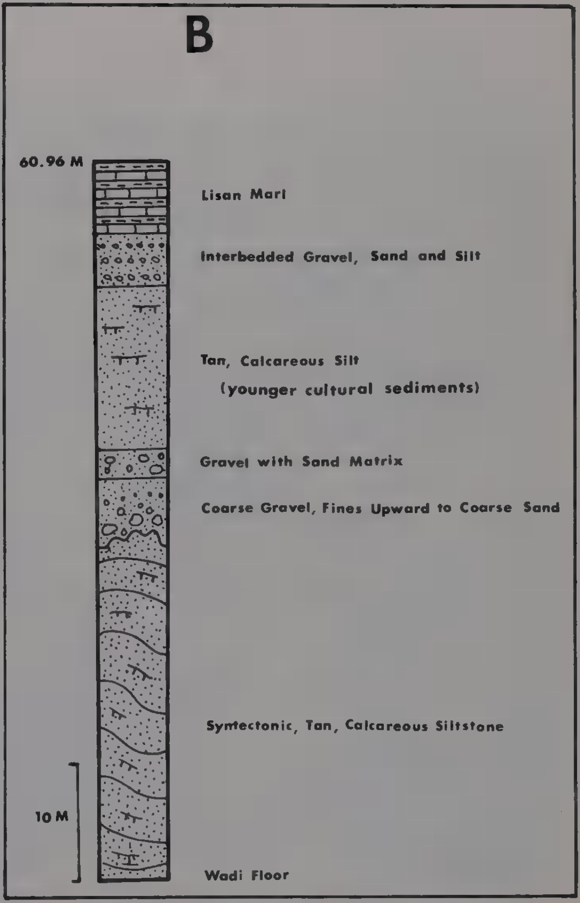

A
66.5 M
Well-Sorted Gravel
Lisan Marl
Tan, Calcareous Sand and Silt
(younger cultural sediment)
Interbedded Sand and Fine Gravel
Coarse Gravel with Sand Matrix
Tan, Calcareous Silt with Gravel Interbeds
Concealed
Coarse Gravel with Sand Matrix
Fines Upward
Syntectonic, Tan, Calcareous Siltstone
10 M
Wadi Floor

Fig. 6. Stratigraphic section measured from Wadi Kerak floor up tributary into Bab edh-Dhra. For location, see fig. 4. Tan, calcareous sand and silt beneath Lisan Marl represents an overlay of younger sediment "plastered" on tributary wall and is actually younger than Lisan Marl.

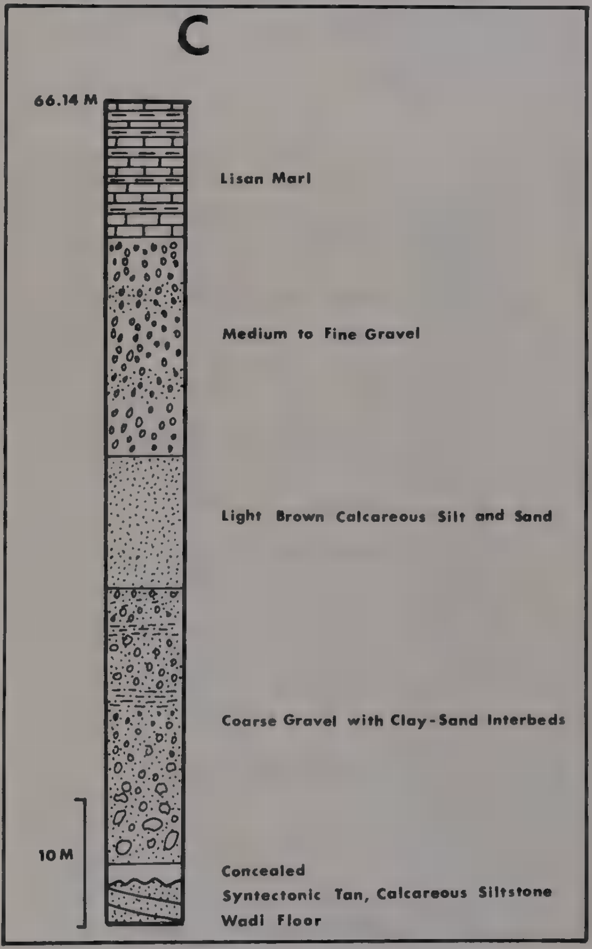

B
60.96 M
Lisan Marl
Interbedded Gravel, Sand and Silt
Tan, Calcareous Silt
(younger cultural sediments)
Gravel with Sand Matrix
Coarse Gravel, Fines Upward to Coarse Sand
Syntectonic, Tan, Calcareous Siltstone
10 M
Wadi Floor

valley. Their fine-grain size and relatively good sorting imply that relief on the eastern escarpment, the probable source for these sediments, was relatively low.

Postsyntectonic units

After erosion of the upper portion of the syntectonic units, renewed fault movement regenerated the eastern escarpment as a sediment source. Flat-lying gravel- to silt-sized sediments were deposited within the Bab edh-Dhra area during Middle Miocene through Middle Pleistocene time. The youngest sedimentary unit near the site is the Lisan Marl, banded sediments deposited during Upper Pleistocene time, 18,000-60,000 years B.P. (Begin, Ehrlich, and Nathan 1974).

Fig. 7. Stratigraphic section measured from Wadi Kerak floor up tributary on north side of Wadi and west of section B (fig. 6). Note absence of younger cultural sediment overlay.


C
66.14 M
Lisan Marl
Medium to Fine Gravel
Light Brown Calcareous Silt and Sand
Coarse Gravel with Clay-Sand Interbeds
10 M
Concealed
Syntectonic Tan, Calcareous Siltstone
Wadi Floor

Three stratigraphic sections were measured at Bab edh-Dhra to establish what types of sedimentary units are present in the area. Two of the sections, A and B, are located on fig. 4 and extend from the Wadi Kerak floor up tributaries into Bab edh-Dhra itself. A third section, C, not show on fig. 4, was measured on the north side of Wadi Kerak, about 100 m west of the beginning point for section B. Figures 5, 6, and 7 are diagrammatic illustrations of the stratigraphic sections.

Although the three sections are somewhat different, they show a generally similar depositional history. In all three sections, a coarse gravel including boulder-sized material with a sand- to silt-sized matrix is present above the syntectonic unit. The sediment is very poorly sorted with upper size limits of up to 90 or 100 cm. The gravel- to boulder-sized material is consistently well rounded. In all three sections, a fining upward is seen. The gravel is cemented by calcium carbonate; undoubtedly precipitated from ground water evaporation in this arid environment. Because of cementation, present erosion of the gravel produces straight or very steep valley walls.

The gravels probably represent channel fills within an arid alluvial fan sequence (Doeglas 1962; Hook 1967). After erosion of the underlying syntectonic units and uplift of the eastern escarpment, the present wadi system was probably established along fault zones in the escarpment. The gravels represent initial build-out by the ancestral Wadi Kerak.

In section C, a 10-m sequence of well-sorted silt-to-sand overlies the coarse gravel. No cross-bedding was noted within the sequence. This may represent a lens of sheet flood deposit, emplaced by water flowing over the surface of the alluvial fan itself (Doeglas 1962). Overlying it is about 15 m of medium- to fine-grained gravel with a sand matrix at some horizons. The relatively good sorting within this unit would again suggest sheet flood deposition with transport of coarser-grained sediment.

In sections A and B, about 15 m of tan calcareous silt is indicated (figs. 5 and 6). At first glance this sequence, located on the side walls of the tributaries presently cutting into Bab edh-Dhra, appears to be part of the natural stratigraphy. Closer examination reveals the presence of abundant cultural materials: mudbrick, pottery sherds, fire lens, and stone "door sockets." This material is actually a much younger cultural sediment deposited during EB time and now covering the natural stratigraphy on valley sides within the Bab edh-Dhra site. The inferred depositional sequence is discussed below in the section on the erosional history of Bab edh-Dhra.

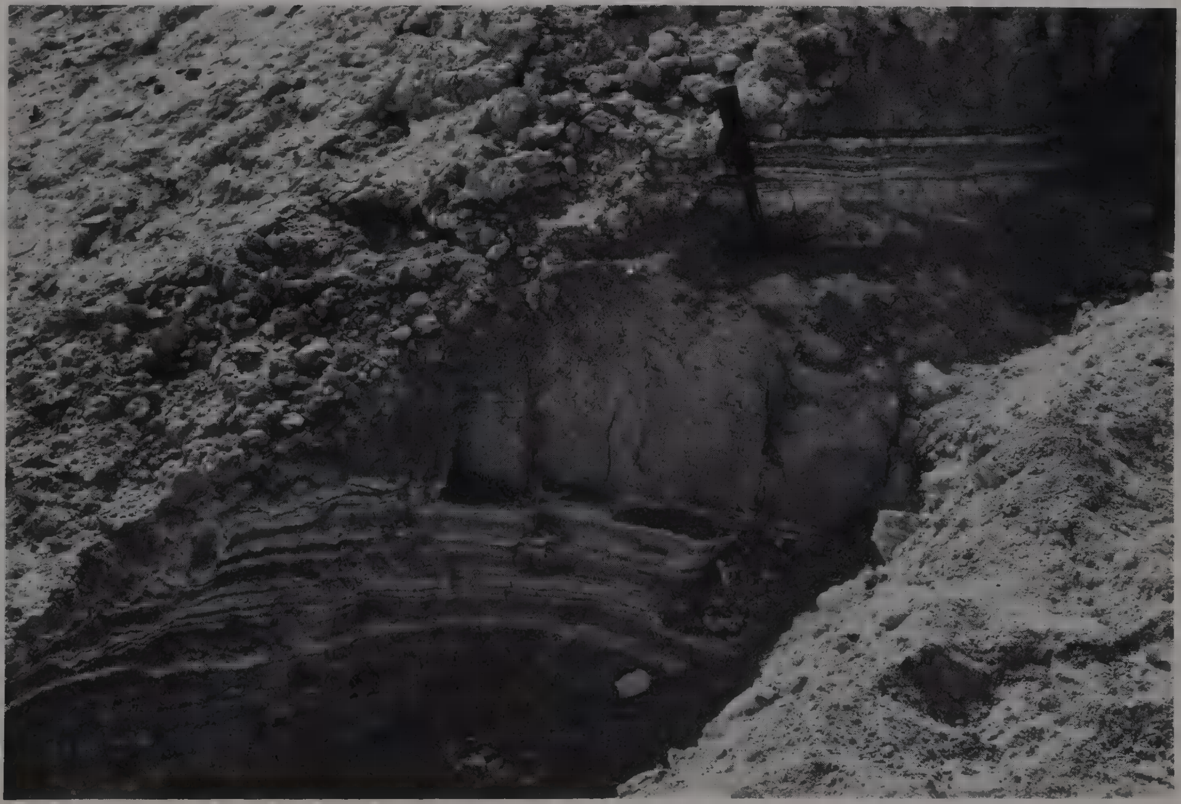
The uppermost unit exposed in all three sections is the Lisan Marl; it ranges in thickness from 5 to 15 m. In section A (fig. 5), its base is concealed by overlapping, younger cultural sediment so total thickness is not known.

The Lisan Marl is characterized by alternations of white aragonite and dark detrital laminations. The white aragonite layers range from 0.5-1.5 cm, while the brown detrital clay layers vary from 1.5-3.0 cm in thickness. In the section examined north of Field XI, (fig. 8), the alternating laminated zone was periodically interrupted by a massive greenish clay layer up to 33 cm in thickness. The Lisan Marl exposed at Bab edh-Dhra is only the lower portion, the laminated member described by Begin, Ehrlich, and Nathan (1974). The upper White Cliffs member has apparently been removed by erosion at this locality.

The well-sorted gravel at the top of section A may represent a minor gravel tongue deposited within Lake Lisan. Bab edh-Dhra is quite close to the eastern escarpment, and it seems likely that the Lisan Marl may well be thinner here than at other localities. This is a marginal or shore line position for Lake Lisan and, most probably, sands and gravels were being transported from the east. There is, in fact, a suggestion that Wadi Kerak was operative during Lisan time. If the Lisan is traced toward Wadi Kerak, along hilltops north of the Wadi, the Lisan Marl appears to be replaced by sand and gravel. This would suggest codeposition of wadi sand and gravel contemporaneously with the laminated sediments of the Lisan.

An alternate and perhaps more likely explanation for the gravels in section A is that they represent a cultural deposit. A similar gravel underlies the structures being excavated at Field XII. The gravels may have been placed there to

Fig. 8. Trench cut through Lisan Marl on upper elevations at Bab edh-Dhra, just north of Field XI. Banded layers consist of alternating aragonite (white) and clay (gray). Thick homogeneous layers consist of clay. Hammer handle is 0.3 m long.



serve as a foundation for a building and/or to ensure good drainage.

The stratigraphic sections at Bab edh-Dhra illustrate an important point. Deposition and erosion of sediments, particularly along the margin of a rift valley, are ephemeral, transitory processes. Summarizing the general sequence seen in the sections, we have deposition, mild deformation, and then erosion of the syntectonic units. Following this is deposition of wadi gravels and sands; lateral equivalents in the center of the rift valley at this time may have been evaporite or lake sediments. Above the alluvial gravels and sands is found the Lisan Marl, a lake deposit, suggesting that relief and, thus, sediments coming from the eastern escarpment had decreased. In post-Lisan time, uplift and renewed erosion produced approximately the topography seen at Bab edh-Dhra today.

Wall Construction at Bab edh-Dhra

Remnants of a continuous wall are present on the east, south, and west side of Bab edh-Dhra (fig. 4). At the northeast corner of the site, the wall turns west but disappears before reaching Field XI; it has probably been removed by postoccupational erosion. At the northwest corner of the site, the wall turns east and has definitely been removed by postoccupational erosion. Sections of mudbrick wall are present on the divide (Field XVI) between the two tributaries cutting into the northern side of Bab edh-Dhra. Excavation did not proceed far enough to expose a lower rock wall, but it seems likely that one is present.

Composition of the rocks used in wall construction was determined at a number of points along its present length. During this examination, a definite pattern of wall construction was discerned. A broad base, 3-4 m across, was established for the wall by placing boulders from the surrounding alluvial fan surface on a flat area. The width varies up to 7 m on the south side of Bab edh-Dhra. The boulders vary in size from 0.1-0.5 m; a size which can be moved by one or two persons.

The base of the wall is exposed near the northeast corner of the site in a trench initially excavated by Lapp (1966). Here the base of the wall is placed on a flat surface, immediately on cultural sediment (figs. 4 and 9). Northward from Lapp's trench, the wall is constructed on an uphill slope to the northeast corner of the site. The outer or east side of the wall exposes a series of broad steps cut into the Lisan Marl, a relatively soft material (figs. 4 and 10). A similar "steplike" construction can be seen at the northwest corner of the site where the wall goes uphill. At these two locations, it is obvious that a flat surface was prepared before wall construction started; it appears likely that a similar process was used for the entire wall. A flat area would result in a more stable structure.

The lower 1-1.5 m of the wall is built from 0.1-0.5 m diameter, generally rounded, boulders. The boulders are composed of a number of different lithic types. The most common are tan to reddish calcareous, fine-grained sandstone and white micritic or fine-grained limestone with brownish, iron stained vugs. Cherty limestone and basalt boulders are found less commonly. The bulk composition of rock types used in wall construction does vary along its length, but there is no distinct or obvious segmentation. It seems likely that the persons building the wall simply used the nearest available boulders on the alluvial fan surface; changes in boulder composition reflect changes in rock type on the fan surface.

The upper surface of the rock wall involves a distinct change in construction style. This is only preserved at two points along the present wall; immediately north of Lapp's trench at the northeast corner of the site and immediately east of Field VIII (fig. 11) near the center of the southern wall segment. At these two points, tabular slabs of sandstone and conglomerate, poorly cemented with calcium carbonate, are present as an upper layer on the wall. These are blocks of alluvial fan sand and gravel cemented by carbonates precipitated from evaporation of ground water. The blocks were probably quarried from within the site itself or from the slopes leading into the Wadi Kerak; abundant exposures are available in both places. The tabular blocks are placed to form a relatively smooth, flat surface as the wall top. The present condition of the wall top east of Field VIII suggests that fine gravel and sand may have been used to fill the spaces between the slabs. The end result is a smooth pavement surface.

The complete stone wall only has an average height of 1.5 m. Although no preserved segments were found, it seems likely that a mudbrick wall may have been constructed on top of the stone

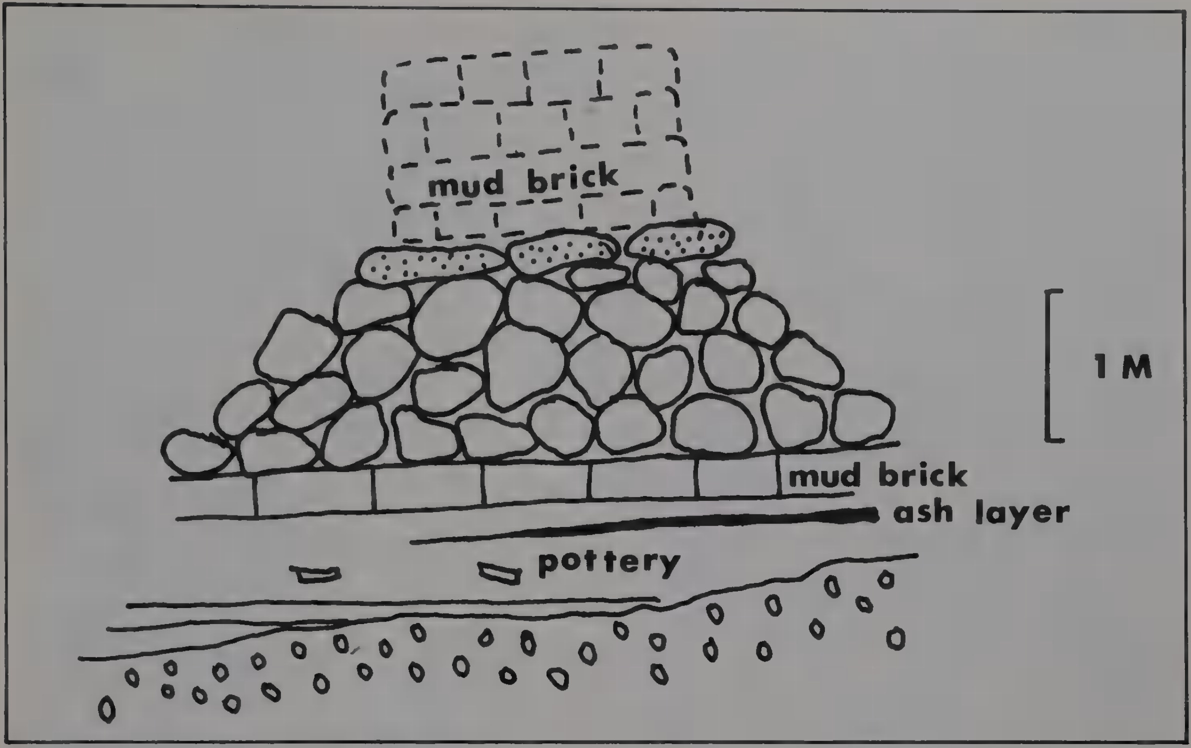
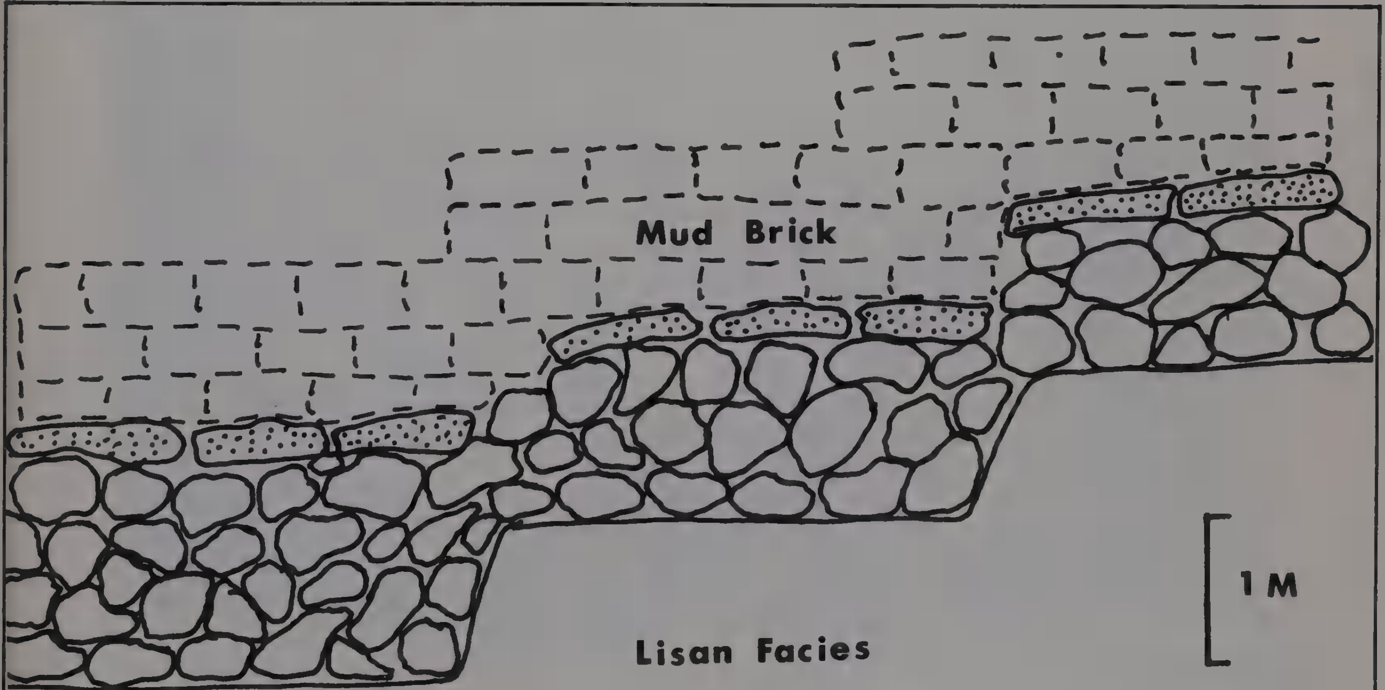


Fig. 9. Diagrammatic cross section showing wall construction where Lapp's (1966) trench (between Fields I and II on fig. 4) cuts through the wall. Stippled pattern at top of rock wall construction shows position for tabular cemented blocks of wadi sediment. Dashed portion with mudbrick indicates position for hypothetical mudbrick wall.

Fig. 10. Diagrammatic longitudinal section showing wall construction on uphill slope north of Lapp's (1966) trench (parallel to Field II on fig. 4). Explanation same as for fig. 9.



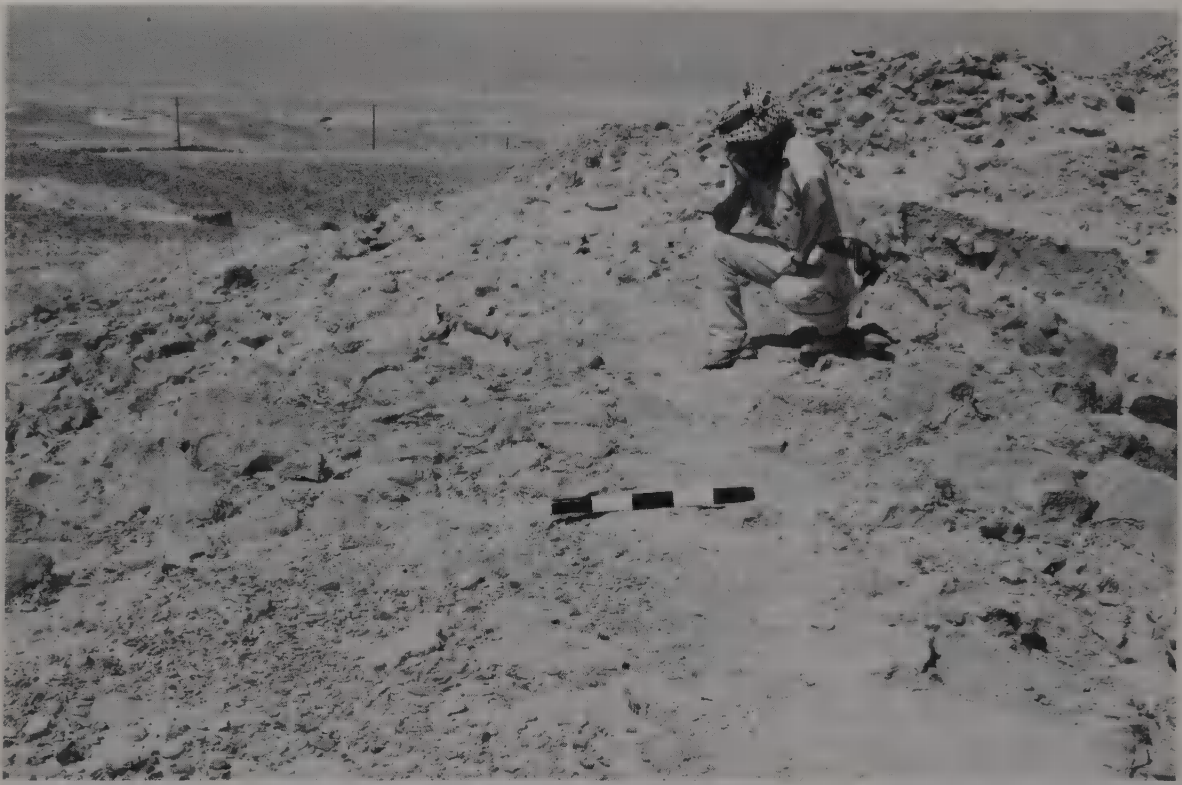


Fig. 11. Upper surface of rock wall east of Field VIII showing flat surface provided by use of tabular cemented blocks of wadi sediment.

wall (figs. 9 and 10). This would provide additional height for a defensive structure. The mudbrick wall partially excavated in Field XVI during the 1977 field season may well represent the upper portion of the outer wall for Bab edh-Dhra.

Erosional History of Bab edh-Dhra

One of the most interesting questions asked of me was how much erosion the Bab edh-Dhra site has suffered since occupation. At first glance, it is obvious that erosion has occurred. Two deep tributaries cut into the northern edge of the site, obviously eroding material from near the center of Bab edh-Dhra and transporting it into Wadi Kerak (fig. 4). In addition, the northern wall of the site is gone; its original position was a matter of speculation. Data pertinent to these questions were uncovered during the last week of my stay in Jordan. I am prepared to give a tentative erosional history for the site, but detailed documentation will require at least another field season. The key to the erosional history of the site is the calcareous sand and silt below the Lisan Marl in stratigraphic sections A and B (figs. 5 and 6). This is obviously a younger cultural sediment and demonstrates a sequence for the site which is somewhat more complex than simple erosion after occupation.

The younger cultural sediments essentially represent patches or erosional remnants on the side walls of the two tributaries cutting into Bab edh-Dhra at the present time. On either side of the westernmost tributary (fig. 12), a thickness of at least 8-10 m of cultural sediment was measured. Obviously, sediment, as well as cultural debris, was being deposited during occupation of Bab edh-Dhra. This sediment was gradually filling in a preexistent valley in the northern portion of the site. After location of this material, excavation into at least 8 m of cultural sediment was begun in Field XVII.

Holocene geologic history for Bab edh-Dhra can be divided into three phases; preoccupation, occupation, and postoccupation. Prior to occupation, the area probably had a topography somewhat similar to that seen at the present time: a relatively flat alluvial fan surface adjacent to the Wadi Kerak. The two tributaries cutting into the

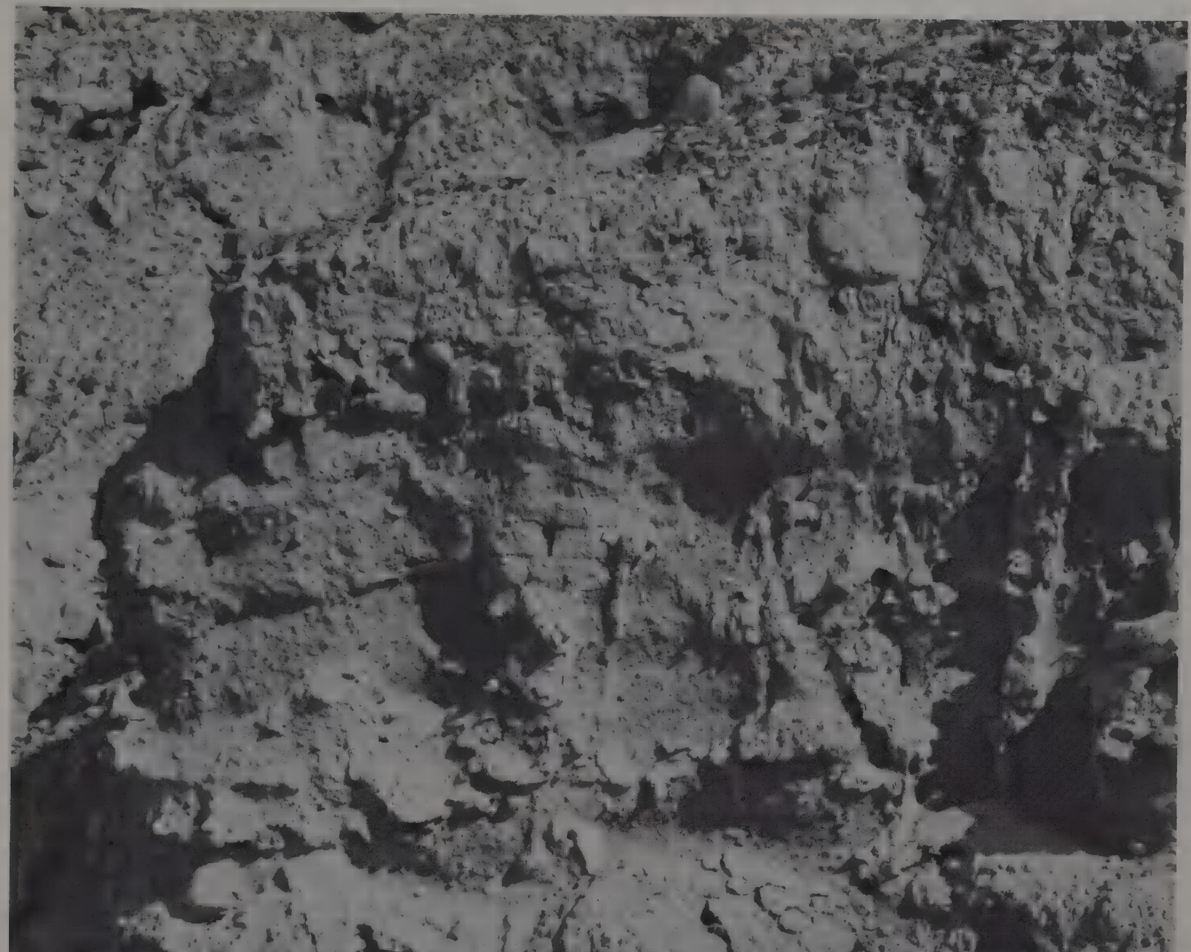


Fig. 12. Column of younger cultural sediment on tributary wall within the Bab edh-Dhra site. This is the tan, calcareous silt located beneath the Lisan Marl on section B (fig. 6). Note remnant of mudbrick wall at height of about 3.5 m.

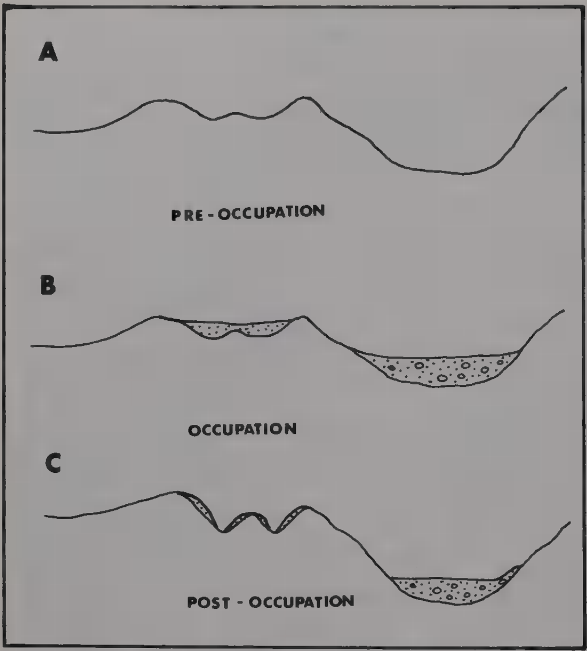


Fig. 13. Diagrammatic sketch for erosional sequence at Bab edh-Dhra. Cross section taken through tributary within Bab edh-Dhra and across to Wadi Kerak. A. Preoccupation with interior tributary and Wadi Kerak shallower than at present. B. Occupation with interior tributary being infilled with cultural sediment. Wadi Kerak was probably also aggrading at this time. C. Postoccupational downcutting through cultural sediment to produce present topography. Cultural sediment is now present as a younger overlay on tributary side walls.

northern edge of the site were present (fig. 13A). Not enough data are available to establish their depth during preoccupation time. The patches of cultural sediment in sections A and B occur at a height of 43 m (section A) and 34 m (section B) above the present wadi floor. These values may represent the approximate depth of the tributaries at the time occupation began; the tributaries would have been shallower than at present.

During occupation, sedimentation was occurring within the two tributaries (fig. 13B). This may have been caused by construction of retaining walls across the two tributaries, but I suspect that Wadi Kerak itself was aggrading or filling with sediment at this time. At present, a 12-14-m alluvial terrace is located along either edge of Wadi Kerak (fig. 14); it seems likely that the terrace is an erosional remnant from an earlier time when Wadi Kerak had aggraded. Roman artifacts are present on the surface of this terrace near the mouth of Wadi Kerak. A detailed survey will be necessary to determine the age of this terrace in terms of included artifacts.

Vita-Finzi (1969: 87) documents the presence of at least four terraces in Wadi Hasa with the two older and higher (ca. 30 and 10 m respectively) terraces containing Paleolithic artifacts. The two younger terraces, at ca. 3 m above the present wadi floor, contain Roman remains. Time did not permit a detailed search for possible multiple terrace levels in Wadi Kerak, but it seems certain that the wadi floor had a higher elevation than at present.

The presence of at least 12 m of sediment fill within Wadi Kerak during occupation would mean that the spring below Bab edh-Dhra would not be available at that time. The spring situated in Wadi edh-Dhra may have still been available however.

The terrain at the head of the western tributary, cutting into the center of Bab edh-Dhra, is suggestive of karst topography with collapse features (fig. 15). It seems possible that during occupation, a spring was present inside the walls of the site. If Wadi Kerak and indeed drainage for the whole region stood at a higher level, ground water would also occur at a higher level and could have supplied a spring for the interior of the site. The presence of one or more interior springs may have, in fact, been responsible for initial erosion of the tributaries which cut into the site, and which were present at the time of occupation.

Several alternatives are available for the position of the missing northern wall at Bab edh-Dhra. The most likely position, as indicated in fig. 4, is supported by several points. As suggested above, the tributaries cutting into the site were probably much shallower than at present. Thus, it may not have been too great a problem to construct a wall across them. Additionally, large (0.5 m) boulders can be seen on both slopes of the western tributary; these seem to be remnants of the base of the outer wall for the site and would fit the straight line projection for the wall, indicated in fig. 4. Finally, Field XVI, opened during the 1977 field season, exposed a section of mudbrick wall which may be an upper portion of the outer wall. Excavation did not proceed far enough to determine whether a stone foundation was present beneath the mud brick. The wall has an east-west orientation which fits well for the postulated wall position.

Information derived from the 1977 field season cannot be used to derive a paleoclimatic sequence.

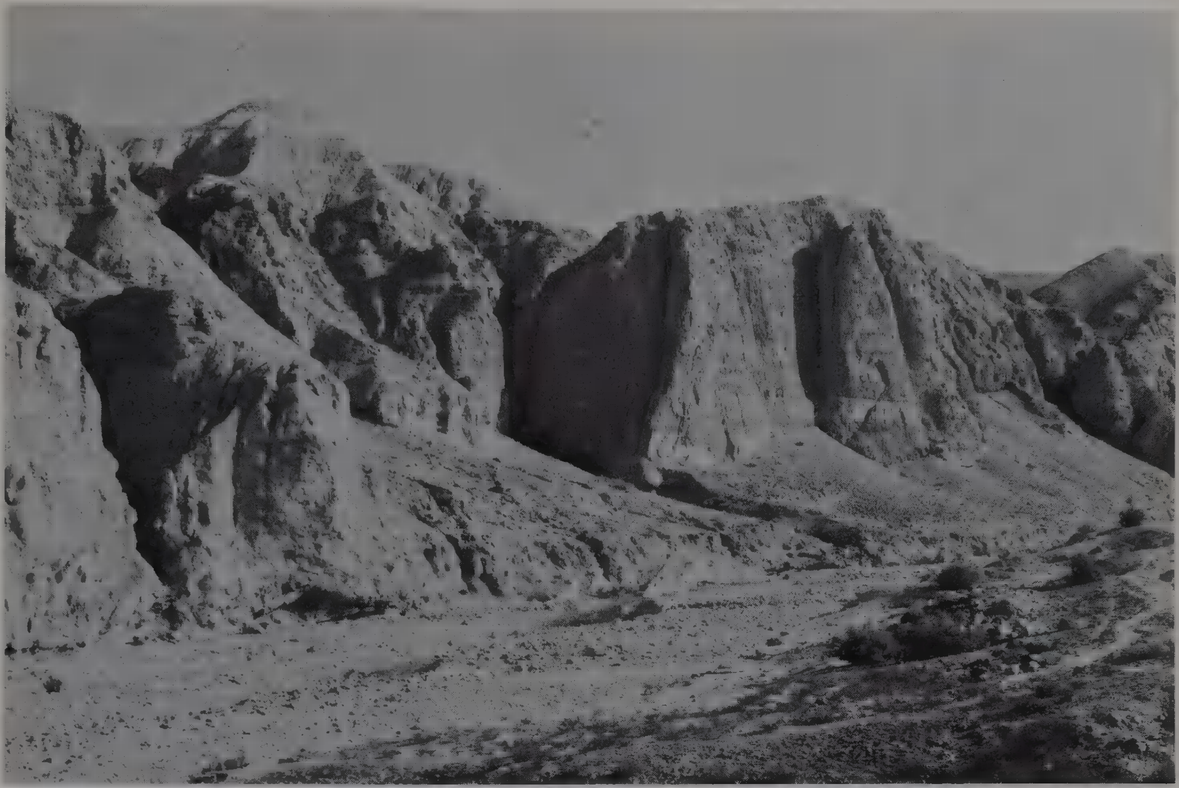
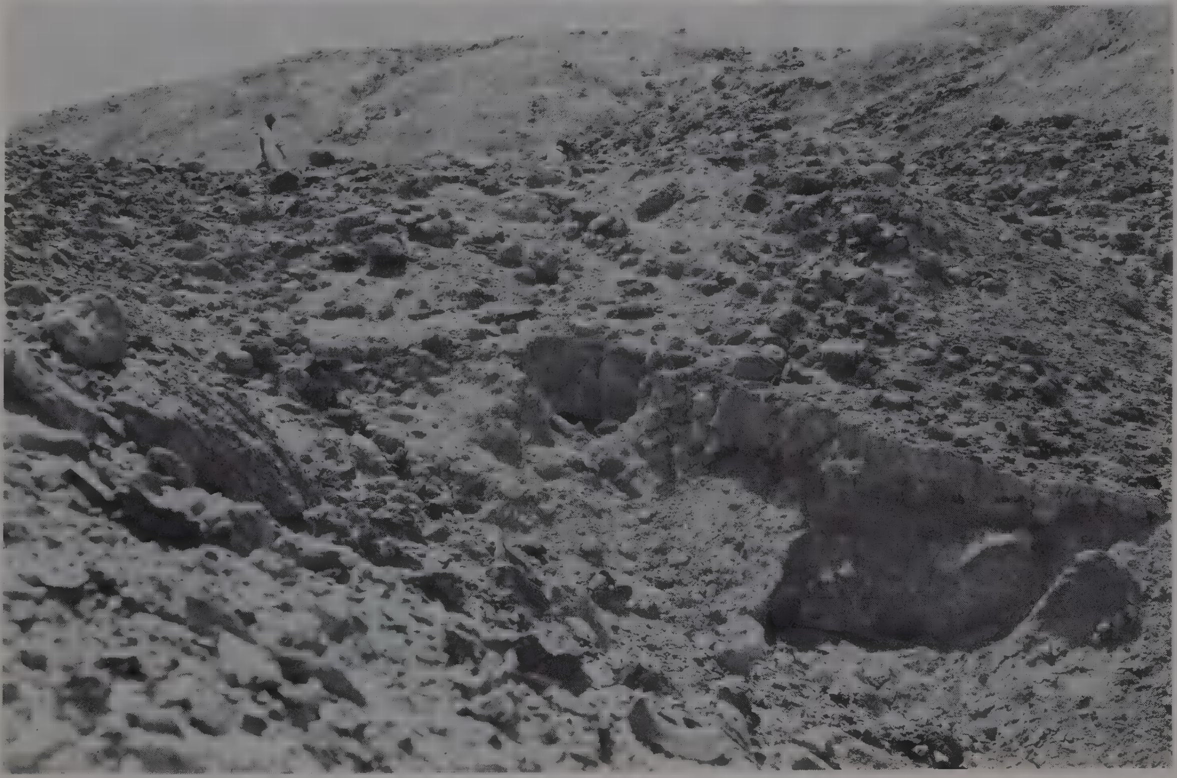


Fig. 14. Alluvial terraces along edges of present floor of Wadi Kerak.

Fig. 15. Collapse feature at head of tributary within Bab edh-Dhra. This feature may mark the site for a spring which was active during occupation.



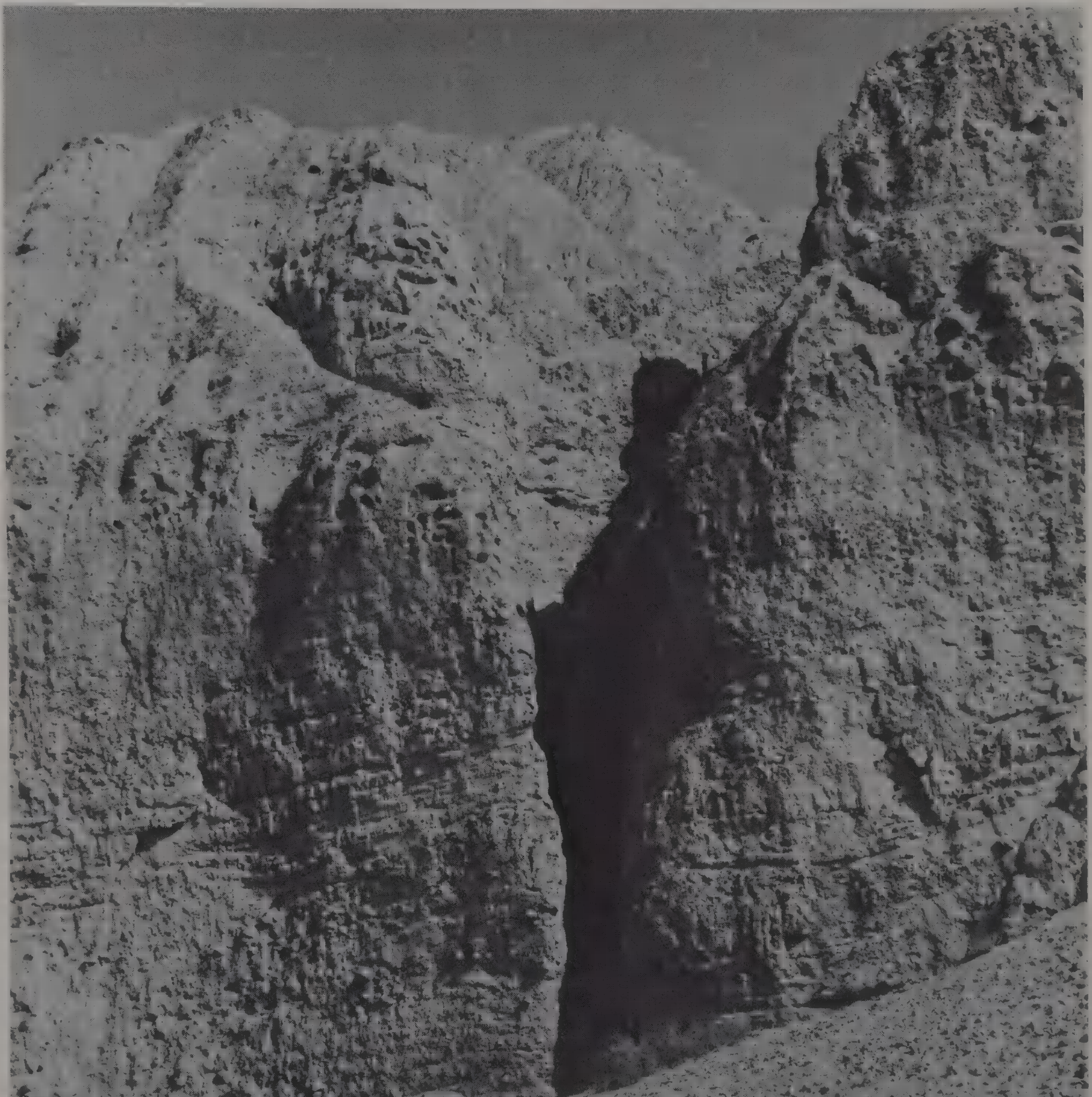


Fig. 16. "Wine-glass" valley on south wall of Wadi Kerak, just west of Bab edh-Dhra. The wine-glass shape suggests fault movement and rapid change in erosional base level. The bowl of the glass represents normal valley development prior to fault movement. After fault movement with a sharp increase in erosional gradients, the straight-walled stem for the glass was rapidly down-cut.

Sedimentation was apparently occurring in Wadi Kerak and at the Bab edh-Dhra site. Whether this is the result of increased water supply and runoff or a lower stream gradient with resulting deposition cannot be determined. Several authors (Neev and Emery 1967; Crown 1972; Butzer 1975; Neev and Hall 1977) suggest slightly more humid conditions during Early Bronze time for the Jordan Valley. The period of moister conditions extends from 5500 to about 4300 B.P. (Crown 1972; Neev and Emery 1967); increasing aridity after 4300 B.P. correlates with the abandonment of Bab edh-Dhra.

Postoccupational history of Bab edh-Dhra is marked by a period of pronounced erosion. Both Wadi Kerak and the small tributaries within Bab edh-Dhra were extensively down-cut during this time (fig. 13C). The cultural sediments emplaced between 5000 and 4300 B.P. were largely removed by erosion. Since the Dead Sea-Jordan River rift is a tectonically active area, it seems most likely that fault movement, either along the border faults or within the rift itself, may have increased stream gradients and initiated active erosion. The narrow straight sides of tributaries entering Wadi Kerak and especially the presence of "wine-glass" valleys (fig. 16) suggest a period of rapid down-cutting. In the case of a 'wine-glass" valley, the upper portion or bowl of the glass represents normal rates of erosion with development of a V-shaped profile. After development of a steeper gradient with markedly increased erosion rates, the stem or straight-sided valley segment is produced.

Contemporaneously with rapid down-cutting, it seems likely that spring disruption might occur. That is, water table levels would be lowered causing higher elevation springs to go dry. Thus, at Bab edh-Dhra, fault movement may have altered both erosion rates and spring locations. The inhabitants may have been faced with destruction of their northern wall by erosion as well as loss of either internal or external springs. More detailed fieldwork at Bab edh-Dhra will certainly result in answers to the erosional history of the site and the part this may have played in abandonment of the settlement.

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Natural Resources of the Southern Ghor

JACK R. HARLAN

Introduction

The first impression of the lands below sea level in the Dead Sea Rift is one of desolation. The landscape has a barren aspect, the vegetation is scanty; light glares from rocks, gravel, and the Lisan Marl and assaults the eyes. Small bands of gaunt goats taken to "pasture" by village herdboys appear to live by eating dust. The heat can be suffocating and relentless and the rocks and soil surface searing to the touch. There is little that is green and some of the springs are sulfurous and salty. Hot air rising in waves warps the landscape; the hills and the Dead Sea distort as if reflected by an amusement house mirror. The impression is of a still, lifeless, inhospitable land.

But the first impressions do not hold up under closer observation and longer experience. There is more to this desert than meets the eye of the casual observer. I shall present, briefly, some observations about the water, land, and vegetation resources of the Ghors for which we have some data, together with some speculations on the possible situation in former times. The remnants of vegetation that remain are clues to what might have been in the distant past.

Water Resources

Rainfall

Jordan has a winter rainfall regime. In the southern Ghors and adjacent highlands no rains have been recorded June through September inclusive, and they are relatively rare in May and October. At Ghor Mazra^{c}a the 28-year record available shows two rains in May and nine in October. In 26 years at Ghor Safi there were three in May and four in October. In the highlands, stations at Kerak, Tafileh, and Mazar show a somewhat higher frequency of May and October rains, but they occur on the average of only one year in three, and some of these produce only a millimeter or less. Thus, the effective rainy season is from November through April.

Official figures are shown in Table 1. The period during which data were recorded is longer than the actual data available because of interruptions due to armed conflict in the region. Data for the first 10 years of record and the last 10 years of record are shown because there is a difference of opinion concerning a possible decline in available water in recent years. The 65 mm yearly average recorded at both Ghors is approximately 2.6 inches and is negligible from an agricultural point of view. Crops must be raised under irrigation, although natural rainfall may replace one or two irrigations during the winter growing season.

Streams and springs

Sources of irrigation water for the southern Ghors are shown in Table 2 (see also the map in the article by Rast and Schaub, p. vi). Wadi Kerak discharges water onto the Ghor only during floods, but some 3 km above the confluence of Wadi Dhra^{c}a and Wadi Kerak a base flow of 250 liters per second (hereafter indicated l/s) has been measured. Use of this water requires an aqueduct. Similarly, water flow increases up Wadi Ibn Hammad and some 5 km above ^{c}Ain Maghara a base

Table 1

Rainfall at Two of the Southern Ghors and Adjacent Highland Stations (from data sheets of Natural Resources Authority, The Hashemite Kingdom of Jordan)

Location and Recording Period	*Range (mm)*
Ghor Mazra^ca 1939/1940-1973/1974	
Ave. 28 seasons : 65.6	(6.5-149.0)
Ave. first 10 years : 63.5	(12.5-100.2)
Ave. last 10 years : 73.6	(22.0-149.0)
Ghor Safi 1939/1940-1973/1974	
Ave. 26 seasons : 65.2	(18.0-151.5)
Ave. first 10 years : 70.3	(35.0-109.6)
Ave. last 10 years : 57.2	(18.0-151.5)
Karak 1937/1938-1973/1974 no missing data	
Ave. 37 seasons : 360.7	(101.9-661.0)
Ave. first 10 years : 414.7	(122.8-540.6)
Ave. last 10 years : 411.5	(187.1-661.0)
Mazar 1937/1938-1973/1974 one season missing	
Ave. 36 seasons : 339.8	(119.8-610.0)
Ave. first 10 years : 414.6	(171.0-491.0)
Ave. last 10 years : 315.7	(136.5-610.0)
Tafileh 1937/1938-1973/1974 no missing data	
Ave. 37 seasons : 280.6	(82.7-751.1)
Ave. first 10 years : 310.8	(131.0-463.5)
Ave. last 10 years : 315.2	(82.7-751.1)

flow of 250 l/s has been recorded (Anonymous 1977). It would require a long aqueduct to bring this flow to the Ghor and no evidence of such an attempt was observed. An ancient aqueduct was constructed at one time to exploit the flow approximately 1 km above the spring. At this point the stream flows through a chute and forms an attractive waterfall. The base flow here was recorded in November 1976 as only 17 l/s.

A much more elaborate aqueduct was once constructed in Wadi Kerak to bring water to the edge of Bab edh-Dhra itself. The upper end has washed away, and it is not certain where the intake was located. From the remains still standing, it seems most likely that the structure was intended to bring water from Wadi Dhra^ca rather than from the strong flow some 3 km farther up. Floods had repeatedly broken the aqueduct which showed evidence of being repeatedly repaired.

Bringing water out of the wadis to irrigate the Ghors has been a standing problem for millennia, because the wadis are subject to violent and destructive floods. Heavy rains in the highlands commonly cause flash floods; walls of water come crashing down through the canyons rolling boulders and cutting away the banks. Broken and abandoned irrigation ditches were found along the sides of each of the wadis. How many more had

Table 2

Sources of Irrigation Water for Southern Ghors (adapted from Binnie Jouzy Arup Bookers Report, 1977)

Location	Ave. yearly base flow (l/s)	hectares irrigable*
Wadi Dhra^ca (near checkpoint)	40	68
^cAin Sikkin (at Ghor Mazra^ca)	65	110
^cAin Maghara (Haditha)	300	510
Wadi Ibn Hammad	150	255
Wadi Isal	30	51
Wadi Numeira	30	51
Wadi Hasa	810	1,377
Wadi Feifa	110	187
Wadi Khanzira	40	68

*based on 250 M^3/irrigation, 10 day irrigation schedule and 50% water loss, 10 l/s can irrigate 17 ha.; or approximately 0.6 l/s can water one hectare.

been built over the centuries and completely washed away we can only guess, but the struggle to maintain irrigation systems against destructive floods has gone on as long as the Ghors have been farmed.

The frequency of floods varies greatly among the several wadis with the largest, Wadi Hasa, being by far the safest. According to estimates of Hunting Technical Services (1973), the predicted flood frequencies per century are: Hasa 2, Isal 262, Numeira 357, Ibn Hammad 440, Feifa 460, Kanazira 512, and Karak 540. Not all of these will cut the banks and destroy canals, but many of them do, and maintenance of the systems has been a perennial struggle.

Data for monthly changes in base flow have been assembled for most of the water sources by Binnie Jouzy Arup Bookers (Anonymous 1977). Peak flows are recorded in February in all cases and the lowest flows July-October inclusive. If we divide the peak February flows by minimal flows, we obtain a ratio of about 1.4 in most cases, but as high as 2.0 for Wadi Isal. Wadi Numeira shows the least fluctuation. Flows begin to rise in November regardless of the rains in the highlands. This suggests that water has been percolating for at least a year from the previous rains. Indeed, there is some evidence that it takes much longer than that. For example, the 1964/65 season broke all rainfall records at Ghor Mazra^ca, Ghor Safi, Tafileh, Kerak, and Mazar, but the base flow at Safi was less than in the previous year and more than the next. In fact, base flow at Safi did not increase until the 1966/77 season. The data available are in Table 3.

We may conclude that base flow fluctuates from season to season and from year to year, but not nearly as much as the rainfall. The springs and live streams appear to be reasonably reliable over the measured time of the last 30 years or more.

A number of local residents expressed the opinion that the water supplies for the Ghors had decreased in recent years. Some did not believe there had been any change. Hard evidence for a decline could not be found in the data available. The rainfall data in Table 1 do not support such a

Table 3

Discharge of Wadi Hasa at Safi in Millions of Cubic Meters (from data sheets of Natural Resources Authority, The Hashemite Kingdom of Jordan)

Season	Mm^3
63/64	29.8
64/65	26.2 (record rains)
65/66	25.1
66/67	38.4
67/68	42.6 (record discharge)
xx no records	xxxx
72/73	26.4
73/74	25.6

pattern, but the time span is relatively short. The longest rainfall records in Jordan are from the Amman airport beginning in 1923. The average to date is 268 mm. At Beirut, records go back to 1880 and the trends, if any, are similar to the Amman records as far as they are contemporaneous. A report by Sir M. Macdonald and Pts. (Anonymous 1965) comments: "... during the period 1880-1920, the rainfall was almost always in excess of the average values, whereas since 1920, apart from a short period of 1938-1945, the rainfall was almost always less than the long term average." The report suggests the possibility of a 40-year cycle, but it is obvious that we do not have data to support or dispute such a possibility.

Water analyses have been made on six of the Ghor sources (Hunting Technical Services Report 1973). The waters are generally similar and fall in the same quality class (C_3-S_1). Salinity, as measured by conductivity at 25° C, ranges from 0.83 millimhos per centimeter (Feifa) to 1.17 mmhos/cm (ᶜAin Sikkin). Total dissolved salts is fairly high, ranging from 531 parts per million (Feifa) to 749 ppm (ᶜAin Sikkin). The calcium/sodium ratio is favorable and pH runs from 8.0 (Feifa) to 8.3 (Wadi Isal). Without getting very technical about it, we can say that the waters carry more salts than we would like, but they are usable. For example, water to be used in the proposed Central Arizona Project (CAP) supplied from Lake Havasu on the Colorado would be decidedly inferior in quality to the waters of the Ghors. Booster and Martin (1977) indicate approximately 1.4 mmhos/cm conductivity and 940 ppm dissolved salts for CAP water. On the Ghors, the best water quality is found at Feifa, but the differences are not great among the six sources.

Converting these measured resources into potential production involves several tenuous assumptions. In Table 2, I have estimated the irrigable area for each water source. This is based on 50% water loss, 250 m^3 per hectare per irrigation, and a 10-day irrigation schedule. That amount of water is equivalent to 25 mm (about one inch) per irrigation. This is reported to be the customary application on the Ghors today, but it is a very light application and must be one of the reasons for the common complaints about salt problems. Heavier, less frequent irrigations would be desirable for long-term farming.

On the other hand, figures available from the Government of Jordan Statistics Department indicate that twice as many hectares are irrigated at least three times per season at Ghor Safi than the 1,377 shown in Table 2. This suggests that my estimate of irrigable area is conservative. The major crop grown in the Ghors today is tomato in the winter season and much of the land lies idle in summer. In EB times, the tomato was not available, and I shall assume that the major food crop was barley. This was the dominant cereal throughout the Near East in those days. Other common food plants of the region were chickpea, lentil, vetch, onions, several other vegetables, grapes, dates, figs, pomegranates, and other fruits. Olives, pistachio, almond, apricot, and other fruits would have been better adapted to the hill country than the Ghors.

The ecological situation must be rather similar to the Salt River Valley of Arizona today, and we can extrapolate some data from there. Water consumptive use for barley in central Arizona is rated as about 25 inches (Erie, French, and Harris 1965) and the growing period about 150 days (Booster and Martin 1977), roughly mid-December to mid-May. Current practice is to apply 2-2.5 acre feet of water in five irrigations. This is a much more liberal allocation than used in the Ghors. If the Ghors were to be irrigated Arizona-style only about one hectare could be watered from a base flow of one liter per second. Thus, if we allot the waters from Wadi Dhra^ca, ^cAin Sikkin, ^cAin Maghara, Wadi Ibn Hammad, and Wadi Isal to the support of Bab edh-Dhra, it follows that current Ghor practices would irrigate about 1,000 ha and Arizona practices somewhat less than 600 ha.

But the barley now grown in Arizona is a highly bred, high-yielding kind that produces three to four times as much as the primitive sorts available in EB times. Indeed, the yields of barley in central Arizona are double or more the current yields of irrigated barley in Jordan (Anonymous 1976). In addition, the calculations have been based on yearly base flows and have not taken into account the February peak flows. Since these occur in the middle of the barley-growing season the extra water would always be available.

I conclude, then, that if the water resources in EB times were approximately the same as they are today, at least 1,000 hectares could have been used to grow food in the vicinity of Bab edh-Dhra, and even more land could have been used with light irrigation regimes. The water was available year-long and perennial crops such as grapes, dates, figs, pomegranates, etc., could have been grown as well as field crops.

Food production

According to Gelb (1965) barley rations of Sargonic and Ur III periods were well standardized: 60 "quarts" for men, 30 for women, 20 for children, and, sometimes, 10 for infants. These are monthly rates. If we translate these into kilograms at 0.6 kg per "quart," we get yearly allowances of 432 kg per man, 216 per woman, and 144 per child. A family of four, (man, woman, and two children) would receive about 936 kg per year or approximately the production of one hectare. The rations appear liberal and more than people are likely to eat. Some could have been fed to animals, sold or bartered.

The population of Bab edh-Dhra is estimated at some 600 individuals. If one hectare can produce more than is needed for a family, there would have been ample land and water resources to feed the town and surpluses should have been available for sale if desired. Adams (1965) calculated a requirement of 1.4 hectares per person for modern Iraq near Baghdad and for ancient Mesopotamia. This includes 50% of the land in fallow. There appears to be enough land in the Ghors to allow 50% fallow if needed, but the greater slope, better drainage and lower water table of the Ghors suggests that such a high percentage of the land in fallow would not be necessary (parts of Ghor Safi might be an exception). Adams' figure would then be 0.7 ha/person, and he admits this is more than necessary for mere subsistence (Adams 1965). These calculations, again, indicate that the resources around Bab edh-Dhra would have been more than ample to support the town.

I have estimated production at about one metric ton per hectare. Jacobsen and Adams (1958) report records from Girsu, southern Iraq at ca. 2400 B.C. of 2,537 liters per hectare. This is equivalent to about 1.5 tons, a yield rarely achieved in premodern agriculture. By 2100 B.C. yields had fallen to about 0.98 tons and by 1700 B.C. to 0.54 tons per hectare. They attribute the decline to salinity, and they are probably correct. The decline in yield in southern Iraq was accompanied by a shift toward a monoculture of barley. Even before the shift, barley was more important than wheat (about 60:40), but by 1700 B.C. wheat constituted only two per cent of the cereal crop (Jacobsen and Adams 1958). Gibson (1974) presents evidence to show that serious miscalculations on fallow requirements caused a disaster in ancient Mesopotamia. The present light irrigation regimes and pressure on the land in the Ghors imply that history might repeat itself.

Resources in Early Bronze times

According to Crown (1972), Palestine was cooler and rainier from 3500-2300 B.C. than it had been for the previous 1,000 years. If this is true, the land and water resources should have been at least as good as they are now, and perhaps even better. But, the literature on the subject is essentially in universal agreement that a severe crisis set in ca. 2300 B.C. Butzer (1976) has a dry regime in Egypt starting at ca. 2350 B.C. based on alluvial sediments, dunes and wind deposits. Crown dates the crisis at 2300 B.C. There is evidence of people moving out of the Sahara and into Egypt in Sixth Dynasty times as shown by cessation of rock paintings and abandonment of sites. The Sixth Dynasty ended with the death of Pepi II ca. 2160 B.C.

At the end of the Sixth Dynasty, Egypt went into an eclipse known as the First Intermediate Period. For 170 years almost no major monuments were erected and we do not even have a reliable record of all the kings' names. After flourishing through EB III, EB cultures collapsed from Greece to Jordan. The Akkadian Empire fell apart 2230-2130 B.C. Ebla was sacked and burned 2250 B.C. and Troy II was destroyed ca. 2149 ± 97 B.C. There was a decline in agricultural communities in Turkmenistan (USSR) climaxing about 2100 B.C. Lakes in the Zagros dried up, while lake bottoms grew weeds that were burned. Salt tongues formed in the Dead Sea, and timber trees died of drought in southern France (Crown 1972).

In the face of all this evidence one can only suppose that the EB towns of the Ghors were experiencing difficulties, too. Our present evidence suggests that Bab edh-Dhra and Numeira were destroyed ca. 2350 B.C., with only Bab edh-Dhra being occupied during EB IV.

". . . the whole land brimstone and salt, and a burnt-out waste, unsown, and growing nothing, where no grass can sprout, an overthrow like that of Sodom and Gomorrah, Admah and Zeboiim which the Lord overthrew in his anger and wrath," (Deut 29:23).

". . . the towns are destroyed and Upper Egypt is become an empty waste . . . grain has perished everywhere . . . the storehouse is laid bare, and he that kept it is stretched out on the ground."—Lament of Ipuwer (Erman 1927).

Plant Resources

The apparent barrenness of the landscape is misleading. There is actually a rich flora in the Dead Sea Rift as indicated by the short list in Table 4. I made no attempt to obtain a complete collection; only the more common plants were sampled in order to characterize the vegetation in a general way. Yet the casual collection turned up representatives of 40 different families. Adaptation to desert conditions has apparently evolved many times from numerous and diverse plant groups.

On the other hand, many of the species are dependent upon rainfall in the highlands rather than in the Ghors. The fern, *Adiantum*, was found only in the dripping spring at Bab edh-Dhra; the umbellifer, *Ammi majus* was growing at the edge of running water at ᶜAin Maghara. The tall, plumed grass *Saccharum ravenae*, the common reed *Phragmites*, the willows (*Salix*), the oleander (*Nerium*), and *Tamarix* were confined to the margins of water courses and wet spots irrigated by perennial streams. Some of the trees (*Zizyphus spina-christi, Acacia* sp.) reach impressive size for a desert land, but their roots reach perennial moisture deep below the surface of alluvial fans.

Other species survive because they are ephemeral, often growing in small depressions that hold a little rainwater for a time after the infrequent showers. They are short-lived annuals; the seeds sprout after a rain, grow into plants a few centimeters high that flower, set seed and die in a matter of weeks. Still others are hardy desert perennials that survive from one rainy season to the next by water conservation and little or no growth during the dry part of the year. Some drop their leaves and go dormant at the end of the rains, others shed large leaves that are replaced by small ones for the dry season.

The Ghors were probably much more lush in vegetation at one time than they are now. Current

Table 4

Short Plant List for the Ghors of Jordan

- Filicales
  - Polypodiaceae
    - *Adiantum capillus-veneris*
- Gymnospermae
  - Cupressaceae
    - *Juniperus phoenica* (Highlands near Dana)
  - Ephedraceae
    - *Ephedra* sp.
- Angiospermae-Dicotyledones
  - Acanthaceae
    - *Blepharis ciliaris*
  - Aizoaceae
    - *Mesembryanthemum nodiflorum*
  - Amaranthaceae
    - *Aerva tomentosa*
  - Anacardiaceae
    - *Pistacia palaestina* (Highlands near Dana)
    - *P. vera* (Highlands cult.)
  - Apocynaceae
    - *Nerium oleander*
  - Asclepiadaceae
    - *Calotropis procera*
  - Boraginaceae
    - *Echium* sp.
  - Capparidaceae
    - *Capparis spinosa*
  - Caryophyllaceae
    - *Sclerocephalos arabicus*
  - Chenopodiaceae
    - *Anabasis setifera*
    - *Atriplex halimus*
    - *Bassia eriophora*
    - *Haloxylon salicornicum*
    - *Salsola tetrandra*
    - *Suaeda palaestina*
  - Compositae
    - *Artemisia inculta=herba-alba*
    - *Centaurea calcitrapella*
    - *C. pallescens*
    - *Cichorium intybus*
    - et alia. unidentified
  - Crucifereae
    - *Anastatica hierochuntica*
    - *Hirschfeldia incana*
    - *Matthiola parviflora*
  - Fagaceae
    - *Quercus calliprinos* (Highlands near Dana)
  - Malvaceae
    - *Malva* sp.
  - Mimosaceae
    - *Acacia raddiana*
    - *A. tortilis*
  - Moraceae
    - *Ficus carica* (cult.)
    - *Ficus* sp. (Petra)
  - Oleaceae
    - *Olea europaea* (cult.)
  - Orobanchaceae
    - *Orobanche* sp.
  - Papaveraceae
    - *Papaver* sp.
  - Papilionaceae
    - *Retama raetam*
  - Plumbaginaceae
    - *Limonium thouini*
  - Punicaceae
    - *Punica granatum* (cult.)
  - Resedaceae
    - *Ochradenus baccatus*
    - *Reseda* sp.
  - Rhamnaceae
    - *Zizyphus lotus*
    - *Z. spina-christi*
  - Rosaceae
    - *Amygdalus communis* (Highlands, cult.)
    - *Amygdalus* sp. (Highlands near Dana)
  - Rutaceae
    - *Haplophyllum blanchi*
  - Salicaceae
    - *Salix* sp.
  - Salvadoraceae
    - *Salvadora persica*
  - Scrophulariaceae
    - *Verbascum syriacum*
  - Tamaricaceae
    - *Reaumuria hirtella*
    - *Tamarix maris-mortui*

- Umbelliferae
  - *Ammi majus*
- Urticaceae
  - *Forsskaolea tenacissima*
- Vitaceae
  - *Vitis vinifera* (cult.)
- Zygophyllaceae
  - *Fagonia mollis*
- Anglospermae-Monocotyledones
  - Palmae
    - *Phoenix dactylifera* (cult. and spontaneous)
  - Juncaceae
    - *Juncus acutus*
  - Gramineae
    - *Cynodon dactylon*
    - *Desmostachya bipinnata*
    - *Dichanthium annulatum*
    - *Elyonurus argentea*
    - *Erianthus* (=Saccarum) ravenae
    - *Hyparrhenia hirta*
    - *Panicum turgidum*
    - *Pennisetum ciliare*
    - *P. orientale*
    - *P.* sp.
    - *Phragmites australe=communis*
    - *Polypogon monspeliensis*

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disturbance is obviously very intense; there are too many people and too many goats in the area. Changes in the last 70 years or so are striking. Libbey and Hoskins (1905) describe Ghor Safi as it was in 1902, commenting:

> We noticed that the great irrigated patch of arable land at the mouth of the Ahsa was practically surrounded and isolated from the barren hills and the wastes of sand and mud by a jungle of Zizyphus and thorny bushes that presented an almost impassable barrier.

Photographs taken in 1902 show the Zizyphus thicket and one of them illustrates a good stand of tall, well-developed *Panicum turgidum*, a perennial grass that still makes an excellent growth in the area wherever it is protected from grazing. In 1977 there was a small enclosure south of the military checkpoint in Safi that had a stand of *Panicum* nearly as well developed as that shown in the photo of 1902. The grass is deep rooted and probably taps moisture under the alluvial fan. Seeds of this grass have been harvested for food, perhaps for millennia, and are still collected in some places.

The desert yields other sources of food as well. *Zizyphus spina-christi* produces a pleasantly edible fruit that is regularly harvested. The trees are extremely thorny so the small boys who climb to the tops of the trees to gather the fruits take the precaution of removing their clothes before the ascent. At several of the Ghors we saw naked boys on the tops of tall christ's-thorns gathering fruit. The small cousin, *Z. lotus* produces a much smaller fruit that is no trouble to collect since the plants are often less than one meter tall. The yield is low, but the fruits incredibly sweet. The date (*Phoenix*) may have been native in the region at one time; it sometimes reproduces spontaneously today. A few of the herbaceous plants could be used as pot-herbs, e.g., *Malva*, or condiments, e.g., *Cichorium*, or medicines, e.g., *Ephedra*, but some are deadly, e.g., *Nerium oleander*. One who wishes to extract food from the desert should know the plants well.

Despite the richness of the flora, the yield is inevitably low. The Ghors are in a desert zone and plants cannot grow without water. The vegetation is fragile, easily overgrazed and easily overexploited. For many species survival depends on tapping moisture supplied by running streams, living springs or infiltrating from the highlands to the alluvial fans of the Ghors.

The Highlands

From the foregoing it is evident that much of the life in the Ghors depends on rains in the highlands. Man and his livestock are not exceptions. The ecological ties between the two zones are intimate, fragile, and sensitive. An understanding of the natural resources of the Ghors must depend to some extent on an understanding of the ecology of the highlands. Unfortunately, there was little time to study the situation in any detail in 1977, and it is difficult, at best, to reconstruct floras that have been degraded to the extent thay they have been in the southern Jordan highlands.

Water delivery in the Ghors depends not only on rain in the highlands but on water retention. How much of the rainfall is trapped and allowed to percolate slowly to the springs below or is released slowly from the upland soils to the perennial streams and how much runs off to come crashing down the canyons in destructive floods depends to a considerable extent on the vegetational cover in the highlands.

Presumably, the woodland was much more extensive at one time than it is now. Woodlands have retreated generally in the Near East and North Africa as a result of clearing for agriculture, overgrazing, charcoal production and use for firewood. Under present population pressures, degradation is extreme. At present, there are very few trees around Karak that have not been recently planted. The hills remain barren to the southward to approximately Tafileh valley where small shrubs make their appearance. The Hasa valley is, today, nearly devoid of trees except near springs or along the stream bed. An occasional remnant of a *Zizyphus* woodland can be found here and there suggesting the formation was once more extensive. Some 18 km south of Tafileh in the neighborhood of Buseira a genuine woodland begins to emerge and reaches its best development near Dana (ca. 26 km south of Tafileh).

The woodland at Dana is dominated by *Quercus calliprinos* and *Juniperus phoenica* and is rather poor in species compared to woodlands of the Zagros or Taurus Mountains. Terebinth (*Pistacia*) and wild almond (*Amygdalus*) do occur as well as a few other species, but they are submerged by the oak-juniper association dominants.

Whether the highlands were in woodland or grassland in EB times, the vegetational cover must have been better than the present one. It would be of interest to know the approximate time range of the present extreme degradation brought about by farming, overgrazing, cutting of woodlands, and so on. Local legend has it that the southern Jordan highlands were deforested by the Turks to fuel the railroad to Medina and Mecca and that the *coup de grace* came during World War I. Photographs taken by Libbey and Hoskins (1905) suggest that the woodland was even more degraded in 1902 than it is now. The environs of Tafileh were remarkably barren then, and Karak was a small village almost entirely within the town walls without a tree in sight. Willcox (1974) conducted a study of woodland degeneration in eastern Anatolia, analyzing charcoals from four different archeological sites. He concluded that Chalcolithic and EB people were exploiting a climatic climax vegetation and that the present state of forest degeneration was not reached until late Medieval times at the earliest and possibly not until the 19th century.

Whatever the history of the upland vegetation may have been, it was important to the Ghors and needs much more careful study. The distance between the two ecological zones is not great, and one can presume a good deal of social contact among the people, exchange of agricultural produce and trading in goods. The Ghors should not be considered as isolated from the highlands.

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Flotation of the Bab edh-Dhra and Numeira Plant Remains

David W. McCreery

Introduction

An objective of the Expedition to the Southeast Dead Sea Plain is the reconstruction of the agricultural systems of this region during the EB period. Examination of present-day agricultural practices, water resources and methods of utilization, collection of modern plant specimens and analysis of soil samples, are all being carried out in order to better understand the agricultural potential of this region. The most important source of information concerning the actual crops being grown in antiquity is, of course, the ancient plant specimens themselves. Occasionally seeds preserved due to the arid conditions of this region were found during the course of excavation, but the vast majority of the plant material recovered was carbonized specimens retrieved by means of flotation.

The painstaking task of separating the plant specimens from the other flotation debris has only recently been completed, and the identification process is still in its initial stages. The task of counting and dating the plant remains according to their stratigraphic context, and confirming preliminary identifications by means of measurements and consultations with other paleobotanists, will take some time to complete. As this is a preliminary report the dates quoted are approximate and the interpretations suggested are tentative. The final report will no doubt involve some revision and refinement of the dates, identifications and interpretations offered here.

Recovery Techniques

Since most plant remains are preserved as a result of carbonization, square supervisors were instructed to collect soil samples from all loci which showed some evidence of burning and to submit them for flotation. Large amounts of soil were submitted from living surfaces or installations which appeared to be particularly promising or important, but most samples averaged around 2 kilograms. A total of 195 soil samples were floated; 112 from the Bab edh-Dhra town site, 17 from the Bab edh-Dhra cemetery, and 66 from the Numeira townsite. An additional 14 small soil samples from these three locations were examined in a dry state.

A simple flotation system similar in technology to that described by Struever (1968) was used to separate the carbonized botanical remains from the soil samples. The flotation tank consisted of a large, locally purchased barrel into which was inserted a custom-made galvanized bucket with a screen bottom. After filling the tank with approximately 5 gallons of water, the soil sample was slowly introduced while the screen-bottomed bucket was rotated back and forth to facilitate the uniform dispersal of the soil and creation of the froth. The float was then skimmed off with a standard kitchen strainer in combination with an 80-mesh gauge brass wire sieve and laid out in a room to dry slowly. After the float had been skimmed off, the screen-bottomed bucket was removed and checked for diagnostic sherds, bone, flint artifacts and seeds which did not float. All the equipment was then carefully cleaned to avoid contamination of the next sample. The scarcity of water at the site made it necessary to conduct all flotation work at the base camp in Kerak where our needs were met by the city water supply.

As each sample was processed, preliminary identifications and observations were recorded in a flotation notebook. The information was made available to square supervisors to keep them up-to-date on the botanical data emerging from their respective areas and to provide guidance for future sample collection. Once the float was thoroughly dry, it was packaged, labelled and set aside to await closer examination at a later date.

At the end of the excavation the packaged flotation debris was taken to the American Center for Oriental Research in Amman, Jordan, where the author separated out the plant remains with the aid of a jeweler's loupe and hand-held magnifiers ranging in power from 3-30 diameters' magnification. The lists which follow represent those plants identified up to this point.

The Plant Assemblages

Bab edh-Dhra Occupational Areas (EB I-IV)

Einkorn-*Triticum monococcum*?
Emmer-*Triticum dicoccum*
Bread Wheat-*Triticum aestivum*?
2-row hulled Barley-*Hordeum distichon*
6-row hulled Barley-*Hordeum vulgare*
Whole Grapes and pits-*Vitis vinifera*
Peach pit-*Prunus persica*
Olive pits-*Olea europaea*
Figs-*Ficus carica*
Bullace-*Prunus insititia*
Chickpea-*Cicer arietinum*
Lentil-*Lens esculenta*
Flax-*Linum usitatissimum*
Pistachio-*Pistacia atlantica*
Almond-*Prunus dulcis*
Wild species include: *Lolium temulentum, Silene* sp., *Carrichtera annua, Medicago laciniata* and *Chenopodium album.*

Bab edh-Dhra Cemetery (EB I)

Grape pits-*Vitis vinifera*

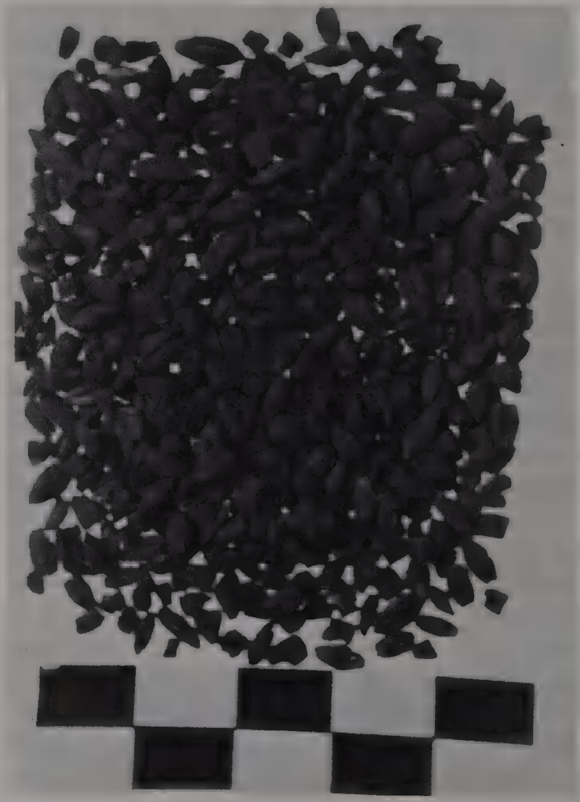
Bab edh-Dhra Cemetery (EB I)

Peach pit-*Prunus persica*
Almond-*Prunus dulcis*

Numeira Town Site (EB III)

Einkorn-*Triticum monococcum*?
Emmer-*Triticum dicoccum*
Bread Wheat-*Triticum aestivum*?
2-row hulled Barley-*Hordeum distichon*
6-row hulled Barley-*Hordeum vulgare* (fig. 1)
Whole Grapes and pips-*Vitis vinifera* (fig. 2)
Olive pits-*Olea europaea*
Figs-*Ficus carica*
Chickpea-*Cicer arietinum*
Lentil-*Lens esculenta*
Flax-*Linum usitatissimum* (fig. 3)
Pistachio-*Pistacia atlantica*
Wild species include: *Bromus sp., Avena sp., Portulaca oleracea, Lolium temulentum, Galium sp., Polygonum sp., Cephalaria syriaca, Melilotus sp., Chenopodium album, Chenopodium murale, Medicago rotata, Ricinus communis, Pinus sp.*, and *Acacia sp.*

Fig. 1. Hulled barley (*Hordeum vulgare*) from Numeira.



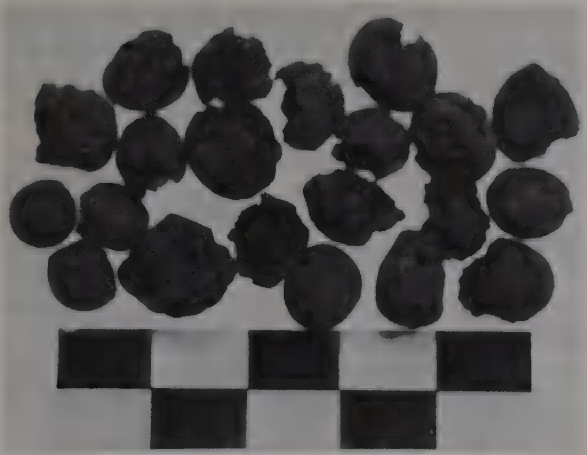


Fig. 2. Whole carbonized grapes (*Vitis vinifera*) from Numeira.

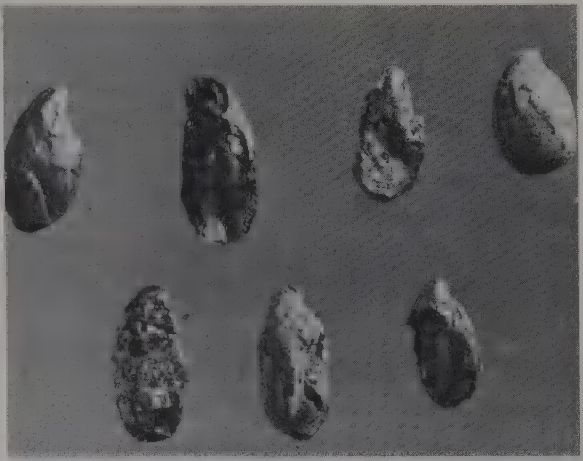


Fig. 3. Linseeds (*Linum usitatissimum*) from Numeira.

Discussion and Interpretation

Comparison of Plant Assemblages from Bab edh-Dhra and Numeira

Even in these initial stages of investigation some interesting comparisons can be made between the ancient plant assemblages of Bab edh-Dhra and Numeira. As the lists indicate, there are many similarities. Plants which appear to have been cultivated at both Bab edh-Dhra and Numeira include various types of wheat and barley, lentils, olives, grapes, chickpeas, figs, and flax. The similarities suggest either that there was an exhange of agricultural products between the two sites or that each site subsisted on an independent agricultural system which closely resembled the agricultural industry of the other. Most likely there is an element of truth in both of these suggestions.

In general the flotation samples from Numeira were richer than those from Bab edh-Dhra, containing a greater number and variety of plant remains. It does not follow, however, that the agricultural industry at Numeira was larger and more diversified than that of Bab edh-Dhra. In fact the opposite was almost certainly the case, judging from the size of the ancient settlements and the present-day land and water resources.

One piece of evidence is of particular importance for this latter item, the water resources. So far no structural remains of EB irrigations systems have been found at either Bab edh-Dhra or Numeira (see the article by Harlan pp. 155-64). Nor are they likely to be found if in fact ditches were used as water canals. Nevertheless, the size of linseeds found at both Bab edh-Dhra and Numeira provides concrete evidence in support of the practice of irrigation, if one accepts the suggestion of Helbaek (1959) that linseeds grown without irrigation do not exceed 4.0 mm in length. After making 13% adjustments for shrinkage caused by carbonization as suggested by Van Zeist (1973: 27) all of our linseed specimens have a length greater than 4 mm, indicating that irrigation was practiced in this region perhaps even as early as the EB I period, ca. 3200 or 3100 B.C.

Importance of Various Ancient Crops and Parallels from Other Sites

Although caution must be exercised in drawing conclusions concerning the relative importance of various crops based on the flotation statistics, the dominance of certain species suggests the possibility that they were the most extensively cultivated crops. At both Bab edh-Dhra and Numeira 6-row barley (*Hordeum vulgare*) and grapes (*Vitis vinifera*) are the most frequent and abundant finds, with olives (*Olea europaea*), figs (*Ficus carica*) and chickpeas (*Cicer arietinum*) also being fairly common. Various types of wheat (*Triticum sp.*), lentils (*Lens esculenta*) and flax (*Linum usitatissimum*) turned up in several samples but in relatively small quantities (less than 10 specimens per sample).

For the first time plant remains were recovered from EB IA shaft tombs during the 1977 excavation. The finds, both of which came from sealed and undisturbed chambers, consisted of a small juglet filled with grape pips and a peach pit found near a skull. The fact that the seeds were included with the grave goods may be an indication that they were especially prized fruits.

The plant assemblages of Bab edh-Dhra and Numeira as a whole and especially the cultivated plants, are strikingly similar to the assemblage recovered from the EB levels of Lachish (Helbaek 1958). All three sites produced grapes, pistachio, chickpeas, lentils, olives, einkorn, emmer, and barley. Only vetch (*Vicia* sp.), hawthorn (*Crataegus* sp.) and grass pea (*Lathvrus sativus* L.) are present in the Lachish material and missing from our plant complex but they may be found during the continuing work.

Some of the food plants found at Bab edh-Dhra and Numeira such as olives, barley, lentils, emmer, einkorn, and grapes have been reported from the Chalcolithic sites of Ghassul (Mallon, Koeppel, and Neuville 1934: 40), Horvat Beter (Zaitschek 1959), Tell Abu-Matar (Negbi 1955), and numerous caves along the west shore of the Dead Sea (Zaitschek 1961), indicating that these plants were common constituents of the human diet in the Near East during the Chalcolithic period. From the Neolithic sites of Jericho (Hopf 1969), Jarmo (Helbaek 1960), Hacilar (Helbaek 1970) and Tell es-Sawwan (Helbaek 1964), emmer, einkorn, bread wheat, 2-row barley, figs, chickpeas, lentils, pistachio, and flax have been recovered, demonstrating that most of the food plants from Bab edh-Dhra and Numeira were being cultivated over a wide area some two thousand years before the genesis of the EB cities of the southern Ghor.

Nevertheless, the plant assemblages from Bab edh-Dhra and Numeira do present some surprises. Both sites display a rather rich variety of cultivated plants for such an early period. Crops such as flax and figs are known to predate the Early Bronze Age but are not commonly found in early archaeological contexts in the Near East (Renfrew 1973: 122, 134). Although carbonized whole grapes have been reported from Salamis (Renfrew 1970), Heshban (Crawford, LaBianca, and Stewart 1976), and Jericho (Hopf 1969), the size of the Numeira hoard which consisted of over 700 whole grapes is very uncommon. Up to this time the author has been unable to locate any ancient parallels to the peach pits from an EB I shaft tomb and an EB I occupational layer at Bab edh-Dhra.

Conclusions

Although our attempts to reconstruct the agricultural systems in the southern Ghor during the Early Bronze Age are still in the preliminary stages, the 1977 fieldwork has advanced our knowledge greatly, answering some questions and raising numerous new ones. There is little doubt that agriculture was an important component of the economic base of the EB cities in this region and that irrigation was a key element of the agricultural industry. Crops which can and do grow in the area today, such as wheat, barley, dates, grapes, chickpeas, lentils, and numerous pulses, were no doubt cultivated locally in ancient times. Figs and flax seem to represent crops which were cultivated in ancient times but are no longer cultivated in this region. Products such as peaches, olives and almonds were most likely grown at higher elevations, perhaps as close as Kerak or Hebron, and imported.

As analysis of the 1977 data continues and as future excavations provide more material for comparison, the nature of the agricultural systems of the EB cities of the southern Ghor will come into sharper focus.

Acknowledgments

The author would like to express thanks to Dr. Jack Harlan of the Department of Agronomy at the University of Illinois, and Dr. Da^cud es-Sawi of the University of Jordan, for their assistance in making or confirming a number of the preliminary identifications of the carbonized plant specimens.

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A Preliminary Report on the Palynological Studies

Susan K. Short

Pollen analysis has been completed at 10.0-cm intervals on a 282.5-cm core collected in 1977 at the Dead Sea, Jordan. In addition, four tuffy traps and a polster sample have been analyzed in order to examine the modern pollen fallout. A sample of Dead Sea sediment exposed by road construction has been analyzed by R. Kohl, Sedimentology Laboratory, INSTAAR; a copy of his report is appended. Samples collected from cultural strata within the EB sites have not yet been received at these laboratories.

Fieldwork

During the 1977 field season, two duplicate sediment cores were collected with a Livingstone corer in the Dead Sea basin in a recently drained area off a construction road (31° 10' N, 35° 33' E; -395 m); each core represented approximately 280 cm. The third thrust of each core was extremely difficult to recover due to friction on the core barrel, and so a fourth thrust was not attempted. To supplement the sediment cores, Wimpey Laboratories Limited allowed me access to several of their cores. The latter were 10.0 cm in diameter and 0.5 m in length. The following samples were collected: Borehole 91: 11.5 M; Borehole 92: 2.6 M, 4.0 M, 6.5 M, 9.0 M, 11.5 M; Borehole 97: 4.0 M, 6.5 M, 9.0 M, 11.5 M; Borehole 108: 5.0 M, 6.0 M, 6.5 M, 7.0 M, 8.0 M, 9.0 M, 9.5 M; Borehole 108A: 5.0 M, 5.5 M, 7.0 M, 7.5 M, 8.5 M, 9.5 M.

In addition, a sample of Dead Sea mud which was exposed by road construction was collected. Although this sample could not be correlated with the core stratigraphy, it was collected in order to have material on which to "experiment" because of the unusual properties of these sediments.

Four tuffy traps were set out to sample the modern pollen rain. These are simple but effective pollen collection traps constructed of containers approximately 10-15 cm tall, tuffy scrapers (nylon pan scourers), and antifreeze, which acts as the liquid collection medium. The following locations were chosen:

(1) Wadi Karak below Bab edh-Dhra
(2) East of Field X
(3) Castle Karak
(4) South of the cemetery area.

One moss polster was collected from the spring in the Wadi Karak below the site. A polster is simply a clump of living moss—which has proven in numerous studies to be an efficient collector of the modern pollen rain. Elsewhere, a polster may represent some 20-30 years of pollen deposition.

An important part of the field sampling program was the collection of samples from archeological strata. As a comparison, scattered soil samples and samples from clay outcrops were also collected. These are:

Surface soil sample no. 1.	Terraced fields
2	Tuffy no. 2
3	Tuffy no. 4
4	Wadi Karak spring excavation, top layer
5	Wadi Karak spring excavation, black layer

6	Wadi Karak spring excavation, third layer
7	Ridge in center of site
8	West boundary of site
9	Cemetery area
Clay sample no. 1	Lisan marl, Wadi Karak
2	Wadi Karak
3	West wall, Field XIII
4	Wadi Numeira
A78 South Balk	Layer 1, surface
	Layer 1, base
	Layer 2, top
	Layer 2, base
	Layer 3
	Layer 4
A 78 SE L9 B18	Floor contact
A 88	Under vertebrae, reed mat (?)
A 100 S L18 B15	Mortar seal
A 80 E L7 B11	Mortar seal
A 120 S L1	Pot no. 2 (basalt bowl) fill
A 56	Charnel house, floor contact
A 86 SE	Under skull no. 2
A 89 NW	Hair (?), carbonized mat (?)
A 86 SE	Under bone pile
NU SE3/2 L30 B58	Fill, stone structure
NU SE3/1 L23 B33	Occupational structure
NU SE3/4 L14	Foundation trench, north wall
NU SE3/1 L9 B7	Sub-surface seed sample
X.3 L5 B132	Surface layer sample
X.3 L59 B133	Bricky wash and fill
X.3 L60 B134	Ashy living levels
X.3 L48 B144	Brick detritus, upper part of locus
X.3 L48 B144	Brick detritus, lower part of locus
X.3 L9 B141	Subsurface, bricky detritus
X.3 L5 B146	Surface layer (over Locus 9)
XVII.1 L13	Floor, "inside room" (?)
XVII.1 L12	Floor, "outside room" (?)
XIII.1 L20 B67	Probably fill (thought to be a floor when sampled)
XIII. L39 B58	Mortar, occupational layer (?)
XVI.1 L12 B29	Midden deposit
XVI.1 L15 B45	Midden deposit, ashy
XVI.1 L14 B36	Mud brick
XIV.4 L4 B20	Fill around stone wall
XIV.4 L9 B17	Mudbrick or mudbrick detritus
XII.7 L11 B40	Mud puddling, top of tabun
XII.7 L17 B52	Fire pit fill
XII.5 L19 B63	Reed matting impression
XII.5 L10 B68	Mudbrick
XII.4 L8 B11	Wood fragments in mud detritus fill
XII.1 L6 B17	Above a mudbrick surface

XII.1 L9 B21	Mudbrick surface
XII.2 L24 B59	Soil under and around a wood post
XII.2 L16 B60	Mudbrick debris
XII.2 L1	NE Balk, topsoil
XII.2 L3	NE Balk, mixed platform and topsoil
XII.2 L7 & 17	NE Balk, mudbrick platform
XII.2 L19	NE Balk, man-laid gravel lens
XII.2 L21A	NE Balk, living layers, top of locus
XII.2 L21B	NE Balk, living layers, bottom of locus
XII.2 L11 B18	Occupational layer, charcoal and ash
F.4 L40 B44	Ash under floor 21A
F.4 L21A & 41 B46	Plaster floor and stratum under it
F.4 L43 B48	Ash lens, west area
F.4 L43 B48	Ash lens, east area
F.4 L45 B50	Floor contact
F.4 L43A & 44 B49	Floor contact and level below
F.4 L49 B54	Ashy area in center of trench below L48 (living area)
F.4 L50 B55	Living area, ash
F.4 L51 B56	Floor
F.4 L52 B59	Living area
F.4 L53 B60	Living area

L = locus, B = basket

Chemical and Laboratory Procedures

In the laboratory, the primary Dead Sea core was extruded, described, and photographed. The stratigraphy is very complex, consisting generally of grey and tan clays with bands of narrow black and white laminae irregularly spaced throughout the core. The core was sampled at 2.5 cm, following this lab's standard policy; the remaining material is being stored in a cold room to prevent deterioration. The following levels have been prepared: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 65, 70, 75, 80, 85, 90, 100, 105, 110, 120, 125, 130, 140, 145, 150, 160, 165, 170, 180, 185, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, and 282.5 cm. Standard chemical techniques, including caustic soda (NaOH), acetolysis, and hydrofluoric acid, were utilized (Faegri and Iversen 1964). "Absolute" pollen counting techniques based on dry weight and exotic additive methods were used (Nichols 1975).

A pollen reference collection, based on a literature search, the plant list of Dr. Jack Harlan based on his 1977 field work, and the Middle Eastern pollen reference collection of Dr. Harvey Nichols, INSTAAR, was put together to aid in the identification of unknown grains. The primary Dead Sea core has been counted at 10-cm intervals to the base (282.5 cm). This wide interval was chosen because of time constraints and because of the lack of obvious changes in the pollen spectra as the counting proceeded. This interval does not allow the recognition of fine changes in the pollen spectra; because of suspected rapid deposition,it seems likely that further detailed close-interval sampling may not reveal further changes. However, if the core, when dated, dates to the Early Bronze Age it would be desirable to fill in sections of the diagram at 5-cm intervals to test this hypothesis. Counting is also complete for the four tuffy traps and the polster sample.

A standard 100-pollen count was chosen. This total is smaller than the usual standard for this laboratory (300 grains) primarily because of time constraints. However, test counts of material from other areas (Nichols 1975, and personal communication) have shown that small pollen totals from slides that have been carefully mixed to give approximately random pollen distribution are as meaningful statistically as substantially larger totals. This is likely to apply to these sediments also but has not yet been tested. Pollen preservation was fair to poor; pollen grains were often torn or partially destroyed. Because there are pollen grains that I have been unable to identify (generally less than 5-10% per level) the results described here must be preliminary in nature. The "unknowns" will need to be checked out before a diagram can be produced. However, I do not anticipate any large changes in the relative percentages of the major taxa.

The data have not yet been run through the computer programs developed at INSTAAR to handle the pollen data (Nichols 1975; Eccles, Hickey, and Nichols 1979). Therefore there are no "absolute" data to present at this time, nor is a diagram, also produced by computer program, ready. Thus the interpretations presented below are based only on the percentage data; they may be greatly expanded when the "absolute" pollen data are available.

Data and Interpretation

The pollen spectrum for the Dead Sea core is rich in species; almost 50 taxa have been recognized. However, only a few taxa are important and consistent contributors. These are Chenopodiaceae (goosefoot family), *Artemisia* (wormwood), Poaceae (grass family), Cruciferae (mustard family), and Compositae (sunflower family). Also important are *Ephedra* (Mormon tea), Leguminosae (pea family), and *Plantago* (plantain). The following discussion will be divided into two parts, the modern samples and the fossil samples.

Modern Pollen Rain

Traps nos. 1, 2, and 4 and the moss polster were characterized by high pine (5-9%), low *Artemisia* ($\leq$ 4%) and generally low to moderate chenopod (30-40%) values, although the polster sample recorded a high chenopod value of 47%. Grass pollen values were variable, but generally high.

Trap no. 3, Kerak Castle, recorded a peak of *Artemisia* of 27%. The pine percentage was small, 1%. This low value for pine, which pollinates in the spring, is probably due to overrepresentation (masking) by local, late-flowering taxa; in this case, the large value of *Artemisia* masks out pine. The "absolute" data may relate better to the substantial numbers of pine trees in the upper reaches of the Wadi Karak around the town. It is also suggested that a more expanded pollen sampling program be planned with pollen traps set out for the entire flowering season.

The polster sample is especially interesting in that a large value (20%) of fern spores, probably *Adiantum* (maidenhair), was recorded. This genus is abundantly represented around the springs.

Fossil Samples

There are three main areas of contrast between the modern and the fossil data:

1. Pine percentages were substantially lower in the fossil spectrum than in the modern samples; only one sample reached 4%, and the majority recorded values in the 1-2% range. Pine, however, was a consistent, though minor, contributor.
2. Grass values were generally small, usually less than 10%. This contrasted with three values of $>$ 20% in the modern samples.
3. *Artemisia* was a consistent and important contributor in the fossil samples. Values ranged between 7-27%, and were generally $>$ 10%.

These changes suggest a drier, weedier environment in the recent past than is the case at present; however, an expanded sampling program of both the modern environment and the Dead Sea basin is needed to test this conclusion. The modern sampling program was biased because samples were out for a very short time in the summer.

There were few changes evident in the entire 282.5-cm core, however. Chenopodiaceae and *Artemisia* dominated the spectrum with combined values of 41-71%. Chenopod values ranged from 29-51%, and were generally greater than 38%. *Artemisia* values ranged from 6-27%; most of the levels recorded values greater than 12%. The entire spectrum suggests that a dry, disturbed (weedy) environment with extensive areas high in salt content (suggested by members of the Chenopodiaeae) dominated the area around the Dead Sea lake basin. The small but consistent values for various tree species (*Pinus*, pine; *Juniperus*, juniper, *Alnus*, alder, *Carpinus*, hornbeam; *Corylus*, hazel; *Juglans*, walnut) suggest the long-distance transport of these pollens from highland areas. It is possible that slightly higher *Artemisia* values in the top half of the diagram and generally higher

Poaceae (grass) percentages in the bottom half are indicative of increasingly dry and more disturbed conditions toward the present.

Conclusions

The lack of change in the Dead Sea pollen spectrum discussed above may be more apparent than real due to the present dependence on percentage counts; analysis of the "absolute" pollen data may clarify the above interpretation. The production of these data and the construction of a pollen diagram is one of the next steps in the analysis. It is also important to date the core. Samples will be submitted to the Smithsonian Institution for C^{14} and amino acid analysis. I do not anticipate, however, that the 282.5 cm recovered represents a very long time period. The analysis of some of the Wimpey Laboratory samples will enable us to evaluate gross changes (at 0.5-m intervals) in the pollen spectrum to 11.5 M; these samples should be chemically prepared and analyzed. It is anticipated that a greatly expanded sampling program needs to be carried out in order to provide a paleoenvironmental background to the archeological researches.

However, one of the original aims of the 1977 pollen sampling program—to find whether there is pollen preserved in the Dead Sea, whether it is recoverable, and whether the preservation is good—has been fulfilled. Another problem—the preservation and interpretation of pollen in an archeological context—now needs to be studied.

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Faunal Remains from Bab edh-Dhra and Numeira

MICHAEL FINNEGAN

The 1977 expedition at Bab edh-Dhra and Numeira proved productive with respect to the amount and type of fauna which were recovered. Eleven fields at Bab edh-Dhra and the total site at Numeira produced animal remains which are analyzed in this report.

Within each field at each site, faunal remains were bagged separately and returned to the laboratory at Kerak. Every afternoon a bone-reading session was conducted whereby each locus of each field was recorded along with its associated faunal material. The bones were originally grouped into broad classifications such as ungulate; large, medium, or small mammal; specific types of animals such as sheep, goats, or donkeys. Special attention was given to butchering marks, rodent gnawing, burning (either oxidation or reduction), and the mature or immature status of the animal, along with the formation of gypsum crystals and charcoal found in each locus bag. Following the field analysis, the bone materials which displayed enough bone morphology to be possibly identified in a laboratory situation were packed for shipping. Bones which could be identified in the field laboratory, but were not unique, were discarded as was other unidentified bone material. Unique finds, identified or not, were shipped to Kansas State University Osteology Laboratory for further analysis. The preliminary report which follows is based primarily on the field analysis and, to a lesser extent, continued analysis in the osteology laboratory.

Faunal Remains, Bab edh-Dhra

Table 1 shows the distribution of bone types from the fields at Bab edh-Dhra. Locus and basket numbers, although recorded with amount and types of bone, are not presented for reasons of brevity, However, the incident-frequency of bone types from that material which could be identified is presented.

Field analysis showed that approximately 92% of the bone could not be identified. Of this, it was determined that an additional 3-5% of the bone material could be identified under controlled laboratory conditions. Undoubtedly the largest portion of unidentified material in the field would correspond well with the amount of material which was identified for any particular field in any particular locus. Additionally, after laboratory examination of the unidentified bone material, groupings were arranged for the basic size of the animal type.

It should be noted that Fields VIII, XV, and XVII produced relatively little material for analysis. The remaining fields produced sample sizes large enough to be worth comment. Even after laboratory analysis the most frequent category for the faunal remains at Bab edh-Dhra was "unidentifiable" representing 26.8% of all the material. The most common animal identified is the combined group sheep-goat, represented by 23.43% of the bone, followed closely by large mammal bones which represented 22.25% of that material identified.

The species which can be assigned to various animals are, in the sheep-goat category, *Ovis aries* and *Capra hircus*, (Boessneck 1969; Boessneck, Müller, and Teichert 1964), although other animals of this size identified include one from the gazelle group, either *Gazella dorcasor* or *Gazella gazella*. In addition to the sheep and goat identified, the presence of the wild ibex (*Capra ibex nuviana*) can not be entirely ruled out as the differential diagnostic elements are greatly reduced. Of the

Table 1

Distribution of animal types by square represented in percent of total fragments (N)

Field or Area	VIII	X	XI	XII	XIII	XIV	XV	XVI	XVII	F	H	Numeira
Small Mammal		1.4		1.0	0.9							1.8
Medium Mammal	8.3	1.4		1.0	0.9			1.3				2.7
Large Mammal	8.3	16.7	29.9	18.0	21.7	25.9	30.8	16.0	28.6	21.7	27.1	19.8
Ungulate Teeth		19.4	13.0	10.0	10.4	18.5	15.4	32.0	14.3	13.0	12.5	13.5
Unidentifiable	41.7	15.3	33.8	41.0	20.8	22.2	38.5	22.7	28.6	14.1	16.7	37.8
Sheep-Goat	25.0	34.7	22.1	20.0	36.8	20.4	7.7	21.3	14.3	30.4	25.0	19.8
Spiral Snail		5.6		3.0			7.7	1.3				
Bivalve Shell				1.0								
Bird	8.3	1.4										2.7
Donkey	8.3	4.2	1.3	5.0	6.6	13.0		4.0	14.3	10.9	8.3	0.9
Pig					0.9							
Cow					0.9			1.3		2.2	8.3	
Human										7.6		
Amphibian											2.1	
Arthropod												0.9
N =	12	72	77	100	106	54	13	75	7	92	48	111
Total %	100	100	100	100	100	100	100	100	100	100	100	100

identified sheep-goat material the ratio is roughly 35% goats and 65% sheep, although if the unidentified material were known, the estimate might well be closer to 50% (Davis 1976 and Lernau 1975).

The donkey, *Equid assinus*, is well represented in most of the fields. In the medium and small mammal range the *Vulpes vulpes* and a number of Canids were recovered, representing either *Cannis familiaris* or a jackal. Additionally the pig (*Sus scrofa*) and cow (*Bos*) are represented. A bird bone, no genus, as well as a number of types of land snails (*Helicacea*?), and possibly one marine shell are seen but have not as yet been identified.

From the presentation in Table 2, the burnt bone, both oxidized and reduced, is seen in a relatively heavy concentration in Fields X, XIII, XIV, XVII, and Area F. Most of this bone is oxidized, suggesting more of a cooking condition, and this is most prevalent in squares in Fields X, XIII, XIV, XVII, and Area F. Butcher marks were found primarily on the sheep-goat bone and unidentified bones while rodent gnawing was seen rarely, and in each case on unidentified bone material. Most of the above animals were utilized as food sources, and it can be noted that a relatively small percentage of the bone is immature.

Faunal Remains, Numeira

Four of the squares excavated at Numeira produced faunal remains for analysis. Of this, most of the faunal material came from Squares 2 and 3 and only one identifiable fragment came from Square 4. The greatest portion of material represented in Table 1 was unidentifiable (in the laboratory) representing 37.8%, followed by identified sheep-goat 19.8%, large mammal 19.8%, and ungulate teeth representing 13.5%. The frequency of small and medium mammals is quite similar to the fields at Bab edh-Dhra, although the donkey is not well represented and the pig, cow, and amphibian remains are absent. One arthropod (a pincer) was recovered. No remains of land snails or marine shells were found at Numeira. The species represented are essentially the same for the remaining categories.

Numeira differs quite markedly from the fields at Bab edh-Dhra with respect to burnt bones, butcher marks, rodent gnawing and tools. At Numeira, 9% of the burnt bone is oxidized and 7% is reduced. This shows a relative increase over any field at Bab edh-Dhra. Butcher marks, however, seem to be more prevalent at Bab edh-Dhra than at Numeira for those fields which produced at least

Table 2

Distribution of artifacts of bone, due to archaeological conditions, rodents, soil conditions, and human intervention

Field or Area	X	XI	XII	XIII	XIV	XV	XVI	XVII	F	H	Numeira
Burnt, Oxidized	6.9	1.3	3.0	4.7	5.6		2.7	14.3	5.4	2.1	9.0
Burnt, Reduced	2.8		3.0	2.8					2.2		7.2
Butcher Marks		3.9	2.0	1.9					1.1	2.1	1.8
Rodent-Gnawed			1.0	0.9							1.8
Immature	4.2	1.3	1.0	5.7	1.8		4.0		3.3	2.1	3.6
Crystals (gypsum)	2.8	14.3	13.0		7.4		10.7	14.3	4.4	18.8	11.7
Charcoal	1.4		1.0			7.7					0.9
Tool				3.8	5.6		1.3		2.2	8.3	2.7

one bone with a butchering mark. Rodent gnawing appears to be more prevalent at Numeira.

Tools

Table 2 shows that Fields XIII, XIV, XVI, and Areas F and H at Bab edh-Dhra and the squares at Numeira produced bone tools. Area H produced tools at the rate of 8.3% of bone fragments shipped to the laboratory followed by Field XIV with 5.6%, Field XIII with 3.8%, Area F with 2.2%, and Field XVI with 1.3%. Numeira produced 2.7% bone tools based on fragments shipped to the laboratory. It is of interest to note the amount of oxidized bone and butcher marks on bone in those fields which also have bone tools. Although there appears to be some association between recovery of tools and the amount of oxidized bone and butcher marks, the association is not strong enough to identify specific job-related activities as being performed in these various areas.

Comparison of Faunal Material from Bab edh-Dhra 1975 and 1977

Based on the preliminary report of the faunal remains of Bab edh-Dhra 1975 (Finnegan 1978), we find that the two seasons were quite similar with respect to the larger mammals. Snails were not recovered during the 1975 season, and bone tools were not found with the faunal material from the fields excavated in 1975. It should be noted that from the 1975 report only Field IX is excluded in terms of the fields excavated in 1977. In addition, Fields XIII, XV, XVI, XVII, and Area H were excavated in 1977, producing generally the same material as the fields previously excavated. Area F in each case produced bone tools in both 1975 and 1977.

Further comparisons either between the excavations 1975-77 or intersite comparisons between Bab edh-Dhra and Numeira are not warranted at this time. We have not yet found such an abundance of bones, particularly in refuse areas, in order to define the full extent to which mammals and to a lesser extent other animals were utilized by these EB people. At the completion of the 1979 season, it should be possible to run analyses of minimum numbers by paired elements (Casteel 1977) as well as to assess those animals which were utilized as food sources versus those animals which were utilized only rarely as food sources or simply not utilized at all.

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Textile Remains and Basketry Impressions from Bab edh-Dhra and a Weaving Implement from Numeira

JAMES M. ADOVASIO and RHONDA L. ANDREWS

In the present context, the term textile is reserved solely for loom-woven cloth, while basketry encompasses several distinct kinds of items including rigid and semirigid containers or baskets proper, matting, and bags. Matting includes items which are essentially two-dimensional or flat, while baskets are three-dimensional. Bags may be viewed as intermediate forms because they are two-dimensional when empty and three-dimensional when filled. As Driver (1961: 159) points out, these artifacts may be treated as a unit because the overall technique of manufacture is the same in all instances. Specifically, all forms of basketry are manually woven without any frame or loom.

There are three major kinds or subclasses of basketry which are generally mutually exclusive: twining, coiling, and plaiting.

Twining denotes a subclass of basket weaves manufactured by sewing stationary (passive), vertical elements or warps with moving (active) horizontal elements called wefts. Twining techniques may be employed to produce containers, mats, bags, as well as fish traps, cradles, nets, clothing, and other "atypical" basketry forms.

Coiling denotes a subclass of basket weaves manufactured by sewing stationary, horizontal elements (foundation) with moving vertical elements (stitches). Coiling techniques are used almost exclusively in the production of containers and, very rarely, bags. Mats and other forms are seldom, if ever, produced by coiling.

Plaiting denotes a subclass of basket weaves in which all elements pass over and under each other without any engagement. For this reason, plaited basketry is technically described as unsewn. Plaiting may be used to make containers, bags, and mats as well as a wide range of other nonstandard forms.

While twining was the only subclass of basketry represented among the finds of the 1975 season at Bab edh-Dhra (Adovasio, Andrews, and Carlisle 1978), two additional subclasses, coiling and plaiting, are present in the 1977 assemblage. No examples of twining were recovered during the 1977 excavations.

The weaving implement from Numeira described below is the first complete example of its configuration recovered from the immediate study area and is included here because of its obvious importance in elucidating EB perishable technology.

Analytical Procedures

As with the 1975 specimens, the highly friable condition of the textile fragments recovered during the 1977 excavations precluded the usual preanalysis cleaning procedures (Adovasio 1977). Rather, the specimens were simply visually scrutinized with a variable power stereoscopic microscope to insure recognition of the construction technique employed.

The basketry impressions from Bab edh-Dhra were analyzed according to procedures specified in Adovasio (1977).

The 1977 textiles and basketry impressions were measured with a Helios needle-nosed dial caliper, and all measurements are presented in the metric system.

Criteria of Classification

The 1977 textile remains and basketry impressions were allocated to three structural types according to procedures and utilizing terminology specified in Emery (1966) and Adovasio (1977). Cordage associated with the 1977 textile remains was classified and described following Adovasio, Andrews, and Carlisle (forthcoming) and Hurley (1979).

The three types established by the aforementioned procedures are presented below by major form category (i.e., textiles or basketry) with numerical prefixes. Herein, it should be noted that the type numbers established for the 1975 textile and basketry assemblage are retained and will be so retained in the final Bab edh-Dhra report. Hence, Type I is employed for balanced plain weave, single warps and wefts; while Type II designates open simple twining, weft type unknown which does not occur in the 1977 assemblage. The additional basketry types recovered in 1977 are assigned type numbers III and IV.

Textiles

Type I: Balanced plain weave: single warps and wefts.

Number of specimens: 1.

Technique and Comments: Single warps and wefts of generally equal size pass over and under each other in a 1/1 interval. Each warp and weft element passes over and under successive warp units, and each successive weft reverses the procedure of the one before it. All warps that lie above one passage of the weft lie below the next passage and so on. The number of warp and weft elements per cm is equal; hence the assignation of the term "balanced" to this type.

In Adovasio, Andrews, and Carlisle (1978), the 1975 Type I: Balanced plain weave specimens from Bab edh-Dhra were divided into a series of six subtypes based on the composition of the vertical and horizontal sets of weaving elements. The 1977 specimen from the site represents a seventh and previously unreported subtype in which both sets of elements are composed of mixed two ply, Z spun, S twist and one ply, S spun units.

The 1977 balanced plain weave specimen is in the form of a sealed globular bag or pouch with a central aperture secured by means of a series of several cordage drawstrings or ties. The specimen is so friable that it is impossible without lengthy stabilization to indicate either the exact mechanics of construction or the specific method of affixing the ties to the bag. Similarly, though the specimen superficially appears to be decorated with simple linear or geometric designs produced via warp and/or weft floats, the type or mechanics of decoration cannot be detailed at present. While it is certain that at least two types of cordage are employed in the ties (four element braid with Z spun elements and three ply, Z spun, S twist cordage), other types may be represented as well. Full particulars on this highly interesting specimen and, hopefully, its contents will be provided in the final Bab edh-Dhra report.

Measurements:

Range in diameter of S spun elements, 0.42-0.55 mm.
Mean diameter of S spun elements, 0.48 mm.
Range in diameter of two ply, Z spun, S twist elements, 0.41-0.57 mm.
Mean diameter of two ply, Z spun, S twist elements, 0.49 mm.
Range in angle of twist, two ply, Z spun, S twist elements, 38°-67°.
Mean angle of twist, two ply, Z spun, S twist elements, 47°.
Range in twists per 0.25 cm, two ply, Z spun, S twist elements, 3-6.
Mean twists per 0.25 cm, two ply, Z spun, S twist elements, 5.1.
Range in S spun elements per 0.25 cm, 3-6.
Mean S spun elements per 0.25 cm, 4.3.
Range in two ply, Z spun, S twist elements per 0.25 cm, 3-5.
Mean two ply, Z spun, S twist elements per 0.25 cm, 4.2.

Raw Materials: All weaving elements are composed of *Linum* sp.

Provenience: Area G 1, Locus 3.

Basketry

Type III: Close coiling, bundle foundation, split stitch on both (?) surfaces.

Number of specimens: 1.

Type of specimens: Wall fragment, 1.
Number of individual forms represented: 1.
Type of form represented: Tray, 1.
Work direction: Left to right, 1.

Technique and Comments: A bundle of elements of unknown composition is sewn with intentionally split stitches which pierce the bundle. There is no gap between stitches. The positive latex cast upon which this analysis is based indicates that stitches are intentionally split on the work surface of the specimen. While it is not possible to specify with absolute certainty, it is highly likely that stitches were intentionally split on the non-work surface as well (Adovasio 1977). The work surface represented by the positive cast is slightly concave indicating that this specimen is a tray fragment. Splice type is not discernible. The specimen is apparently undecorated at least on the extant surface. The tight packing of the stitches suggests that the original specimen was potentially watertight.

Measurements:
Range in diameter of coils, 5.35-6.05 mm.
Mean diameter of coils, 5.7 mm.
Range in width of stitch, 1.70-2.20 mm.
Mean width of stitch, 1.95 mm.
Range and mean gap between stitches, 0.
Range and mean coils per cm, 1.5.
Range in stitches per cm, 3.5-4.0.
Mean stitches per cm, 3.75.

Raw materials: Stitches appear to be made of longitudinally and bilaterally split reeds, genus/species unknown; while bundles are of unknown composition.

Provenience: Field XII.2, Locus 20.

Type IV: Simple plaiting, 1/1 interval.

Number of specimens: 1.
Type of specimen: Wall fragment without selvage, 1.
Number of individual forms represented: 1.
Type of form represented: Mat, 1.

Technique and Comments: Two sets of three elements each cross over one another in a 1/1 interval. The three elements in each set are arranged side by side with no overlap and function as a single unit. There are no shifts. The specimen is undecorated on the extant surface and no splices are represented.

Measurements:
Range in diameter of individual plaiting elements, 4.90-5.55 mm.
Mean diameter of individual plaiting elements 5.22 mm.
Range in diameter of sets of three elements, 1.65-1.80 cm.
Mean diameter of sets of three elements, 1.73 cm.
Range and mean angle of crossing of plaiting elements, 90°.

Raw materials: All elements are made of longitudinally split reeds, genus/species unknown.

Provenience: Tomb A 89 NW.

Weaving Implements

Number of specimens: 1.

Technique and Comments: Elongate in plan and concave-convex in cross section, this specimen is made on a left (?) rib of a bovid, presumably *Bos* sp. The rib has been longitudinally split, and the specimen exhibits cancellous bone on the inner surface. The sternal end of the rib has been bilaterally tapered presumably via grinding to a slightly asymmetrical point; while the vertebral end lacks all articular surfaces. The articular termination of the bone was removed via a transverse cut or break. The vertebral end exhibits a long notch running from the transverse cut some 3.55 cm parallel to the long axis of the specimen. The notch tapers gradually to the outer edge or margin of the specimen and presumably functioned as a finger grip. Both the inner and outer surfaces as well as all margins of the specimen exhibit heavy polish, while the pointed end is circumscribed by a series of transverse striations extending from the tip 1.74 cm up the long axis of the implement. These striations indicate that the tool was employed in a boring or rotary fashion which in turn strongly suggests that the implement is an awl used in the production of coiled basketry. Further particulars on this implement will be provided in the final Bab edh-Dhra report.

Measurements:
Maximum length, 17.8 cm.
Maximum width, 2.20 cm.
Maximum thickness, 1.60 mm.

Provenience: Numeira, SE 3/2, Locus 20 (Reg. No. 1304).

Internal Correlations

Technology, Form, Function

Though numerically small, the 1977 assemblage of textiles and basketry impressions from Bab edh-Dhra provides significant new data on perishable technology during the Bronze Age in the study area. Specifically, the extant assemblage indicates both the production and/or use of coiled and plaited basketry at the site as well as the manufacture of yet another subtype of balanced plain weave.

While it is still very doubtful that the combined 1975 and 1977 collections reflect the full suite of textiles and basketry known to the Bab edh-Dhra weavers, the range of basic construction techniques, particularly in basketry production, has been considerably expanded.

The "new" specimen of Type I balanced plain weave with its regularity of execution and narrow gauge of weaving elements confirms our earlier notions that the Bab edh-Dhra textiles scarcely represent "primary essays in the craft." Further, the 1977 Type I specimen also directly indicates the presence of heddle looms either at the site itself or in the surrounding area. Additionally, the 1977 specimens of plain weave provide us with our first real glimpse of at least one of the forms produced by this medium.

The presence of plaited mats and coiled trays in the repertoire of the Bab edh-Dhra weavers provides us with further insights into the range of forms produced at the site and also presents direct evidence that these techniques and products have great antiquity in the study area.

Finally, the weaving tool from Numeira graphically indicates that awls specifically used for the production of coiling were an integral part of the weaver's tool kit during the Palestinian Bronze Age.

Raw Materials

Once again, only two fiber sources are represented in the Bab edh-Dhra perishable assemblage. As in the 1975 sample, these include a lacustrine or fluviatile reed of unknown genus or species and *Linum* sp., the identification of which is positively confirmed. The occurrence of *Linum* sp. at the site is also indicated in the plant macro-fossil collections and presently provides the earliest reliable evidence of this fiber source in the general Syro-Palestinian area.

The use of longitudinally split reeds for the production of plaiting and coiling is consistent with construction practices reported from other Near Eastern sites and underscores the versatility of this highly plastic construction medium.

As noted previously (Adovasio, Andrews, and Carlisle 1978), in addition to longitudinal and bilateral splitting, considerable presoaking of the reeds to facilitate flexibility was doubtless an inherent part of the Bab edh-Dhra weaving art.

Chronology

The 1977 Type I textile fragments and the Type III and IV basketry may be ascribed to the late 4th millennium (3100) B.C., thus predating all but the Type II Open simple twining of the 1975 assemblage (which is of the same age). The weaving implement from Numeira is slightly later in age and is tentatively dated at 2900-2500/2400 B.C. The 1977 Bab edh-Dhra assemblage extends the range of plain weave some 500 years further back than the 1975 sample and underscores the antiquity of both loom weaving and the use of *Linum* sp. in the study area.

Despite the extension of the time ranges for perishable production noted above, it is still premature to attempt reconstructions of local developmental sequences. Hopefully, such a sequence will be forthcoming after the Bab edh-Dhra textile and basketry analysis is completed.

External Correlations

The 1977 textiles and basketry impressions from Bab edh-Dhra confirm our earlier observations that this perishable assemblage may be ascribed part and parcel to the general milieu of Near Eastern basketry and textile production, the beginnings of which lie in the late Pleistocene and early post-Pleistocene, ca 9500-9000 B.C. As noted previously, the structural types represented at Bab edh-Dhra have been reported from a large number of Near Eastern sites, and both have very great antiquity (Adovasio 1976), extending back to at least the mid-10th millennium B.C. Moreover, all techniques persist into historic times and are probably represented in various subareas of the modern Near East. The possible affinities of the Bab edh-Dhra textiles and basketry to other earlier, contemporary, and later Near Eastern assemblages will be detailed in the final report.

Summary and Conclusions

In retrospect, the salient attributes of the Bab edh-Dhra textile and basketry assemblage as suggested by the analyses of both the 1975 and 1977 collections are:

(1) Technically well-made cloth as well as twined, coiled, and plaited basketry were produced and/or used at Bab edh-Dhra during the period 3100-2600 B.C.
(2) The relative sophistication of the cloth fragments suggests not only the use of heddle looms but also long-term antecedent development of this industry.
(3) The use of *Linum* sp. as a fiber source represents the earliest dated exploitation of this plant for perishable production in the Syro-Palestinian area.
(4) The Bab edh-Dhra assemblage may be allocated to the general milieu of Near Eastern basketry and textile production, the beginnings of which lie in the late Pleistocene or early post-Pleistocene, ca. 9500-9000 B.C.

ACKNOWLEDGMENTS

Assistance in the identification of the bone used for the construction of the weaving tool from Numeira was provided by Dr. J. Schwartz and Mr. D. Dirkmaat. Valuable insights into the use of bone tools in the study area and contiguous regions and useful data on the Chalcolithic and Bronze Age prehistory of the Levant were provided by Dr. J. Schwartz and Mr. M. McConaughy, respectively. The positive cast of the coiled basketry impression was provided by Mr. W. C. Johnson. This manuscript was edited by R. Carlisle and typed by Ms. Ginger LoAlbo.

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A Preliminary Report on the Bab edh-Dhra Site Survey

Mark A. McConaughy

A survey of the area immediately adjacent to Bab edh-Dhra was conducted during the 1977 season by the author and John Opie in order to locate any outlying hamlets or homesteads that may have helped support the EB population of Bab edh-Dhra. Unfortunately, due to the existing problems in the Near East, the survey had to be confined to the alluvial fan deposits at the mouth of Wadi Kerak. It is *not* a survey that examined all geographic zones that might have been exploited by the inhabitants of Bab edh-Dhra. The vast majority of the survey was conducted on foot and approximately 90% coverage of the alluvial fan was obtained. The fan is heavily dissected by erosional features and each remnant ridge was examined for possible habitational debris. The erosional features were examined for secondary deposits of artifacts. The fan can be divided roughly into an upper and a lower fan area. Bab edh-Dhra is situated on the upper fan which is higher in elevation than the lower fan. The lower fan lies for the most part to the west of the Safi-Mazra road.

A light scatter of Paleolithic material was found over much of the alluvial fan. Undoubtedly this is due to the fact that large nodules of chert are found on and in the fan, and these were subsequently picked up and utilized to make tools. The resultant chipping debris and scattered retouched tools that were found everywhere are mute testimony to this practice. However, a site was recorded only if relatively dense concentrations of retouched tools and/or blades were located. The presence of sherds and/or structures of some sort were other criteria for defining and recording a site. Materials were selectively picked up and saved since they had to be carried back to the base camp at Bab edh-Dhra on foot and this limited the amount of material that could be saved.

A total of 21 new sites were located during this survey. These are listed in Table 1 along with the appropriate topographic map coordinates and cultural affiliations.

Summary of Survey Discoveries

A number of the sites have stone foundations representing walls of some form or structure. B.D.S. no. 1 (Bab edh-Dhra Survey) has a circular hut foundation approximately 4.5 m in diameter with a smaller attached circular structure approximately 1.5 m in diameter. The "associated" materials consist of Paleolithic tools. No sherds were encountered near the structure. However, it is difficult to accept this as a Paleolithic hut foundation without further work, since Paleolithic tools are scattered all over the upper fan area and the association may be fortuitous.

B.D.S. no. 2 consists of a crescent-shaped arrangement of piled cobbles approximately 9 m in length. Only Paleolithic materials were found near this structure. It is possible that this represents a Paleolithic windbreak. However, further work is needed to confirm this.

A rectangular stone hut foundation was found at B.D.S. no. 5. It is approximately 3 × 7 m in diameter with a foxhole dug into the center of it. This may represent an outlying EB farmstead that helped support Bab edh-Dhra.

B.D.S. no. 10 had the remains of three structures. It is situated on top of an east-west-running

Table 1

Summary of Survey Discoveries

B.D.S.* Site No.	Topographic Map	Map Coordinates U.T.M.	Cultural Affiliation**
1.	Er Rabba	N 3,460,550 E 742,000	P.
2.	Er Rabba	N 3,463,600 E 742,000	P.
3.	Er Rabba	N 3,461,450 E 742,000	L.P.
4.	Er Rabba	N 3,461,950 E 740,800	E.B.
5.	Er Rabba	N 3,461,100 E 741,250	E.B.
6.	Kerak	N 3,459,400 E 741,150	P.
7.	Kerak	N 3,457,150 E 742,200	P.
8.	Kerak	N 3,457,550 E 742,600	P.
9.	Kerak	N 3,457,350 E 742,650	P.
10.	Kerak	N 3,457,100 E 742,650	P., U.C.
11.	Kerak	N 3,457,600 E 743,600	E.B. (L.P. nearby)
12.	Er Rabba	N 3,460,650 E 739,150	M., U.C.
13.	Er Rabba	N 3,460,400 E 739,700	R., By., Cr.
14.	Er Rabba	N 3,460,150 E 739,600	E.B., R., By.
15.	Kerak	N 3,459,800 E 741,900	P.
16.	Kerak	N 3,459,925 E 741,850	P., By.
17.	Er Rabba	N 3,460,350 E 739,400	E.B.
18.	Er Rabba	N 3,460,350 E 738,700	E.B.
19.	Kerak	N 3,459,850 E 739,250	E.B.
20.	Kerak	N 3,459,650 E 739,250	E.B.I.
21.	Kerak	N 3,456,400 E 742,200	M.P.

*B.D.S. = Bab edh-Dhra Survey
**P. = Paleolithic, L.P. = Lower Paleolithic, M.P. = Middle Paleolithic, E.B. = Early Bronze, R. = Roman, By. = Byzantine, Cr. = Crusader, M. = Mamluk, U.C. = Unidentified Ceramic.

ridge/rock outcrop. Two circular-to-ovoid piles of rock were found, one at each end of the ridge. The circular structure on the west end of the ridge consists of an inner solid circular rock rubble core (some of this may be a modification of the existing natural rock outcrop) with an outer ring of stones encircling the core. The core is approximately 10 m in diameter, and the outer ring is approximately 15 m in diameter. The eastern solid circular pile of rocks is approximately 5 m in diameter. In between these two structures is a rectangular structure enclosed on only three sides. The northern facing side lacks a wall foundation. This structure is approximately 6 × 3 m in size. The site produced a few sherds of an unidentifiable nature.

Some other interesting items were encountered during the course of the survey. A hand ax and a chopping tool (fig. 1) were found approximately 50 m northwest of B.D.S. no. 11. Other solitary Lower Paleolithic finds include another cruder hand ax, an excellent cleaver, a couple of chopping tools and some cores. All were found on the upper fan south of Bab edh-Dhra. Some of the tools were rolled while others were not and must be considered to be found *in situ* where they were originally discarded. All of the tools have a heavy coat of desert varnish and are of a yellowish or reddish brown color.

Only B.D.S. no. 3 can be considered to be a full-fledged Lower Paleolithic site. Unfortunately it is secondary deposition as all of the artifacts have been rolled and were found eroding out of the south bank of Wadi Kerak. One small hand ax and a bill hook were among the tools recovered at the site.

B.D.S. no. 21 is the only site that can be

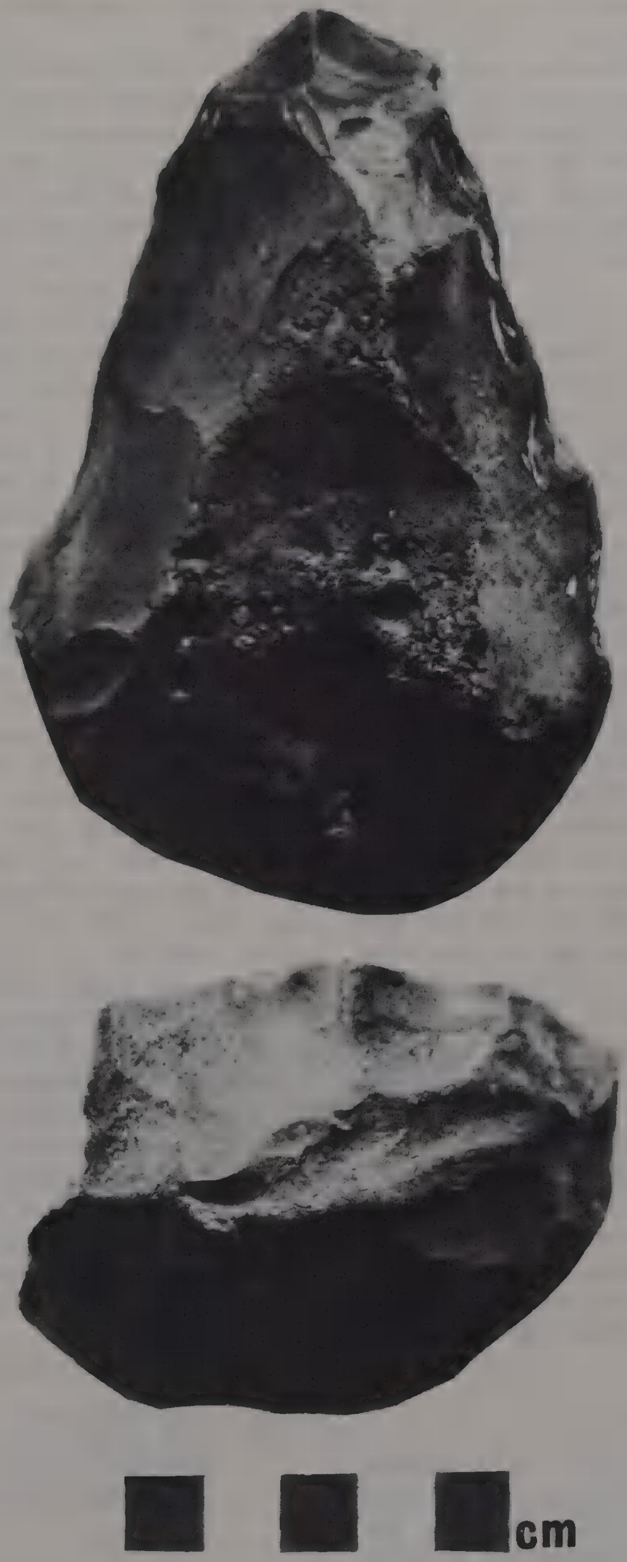

Fig. 1. 1—hand ax; 2—chopping tool found approximately 50 m northwest of B.D.S. no. 11.

assigned definitely to the Middle Paleolithic. Two Levallois points are among the tools recovered at this site. All of the tools have a heavy coat of desert varnish and are of a dark gray to black color. Based on the similarity in the appearance and color of the tools, it is felt that the majority of other Paleolithic sites located on the survey probably are of the Middle Paleolithic period. However, no Levallois flakes or points were found on those sites.

The sites of Safi, Feifeh, and Khanazir also were visited during the course of the survey. All of these sites were previously recorded EB settlements south of Bab edh-Dhra. The materials collected at Safi consisted of Early Bronze Age, Roman, and Byzantine sherds. At Feifeh EB sherds were recovered and saddle-shaped querns were noted but not saved. Collections of quartzite tools of Paleolithic nature were made along with typical EB tools to the east and southeast of the walled town. A fragment of a Levallois flake hand ax and a nongeometric microlith also were found to the southeast of Feifeh. Very few sherds or artifacts were found near Khanazir. The only identifiable sherd was from the Iron Age.

The aqueduct in Wadi Kerak below Bab edh-Dhra also was examined during the course of the survey. The aqueduct has been assumed to be of Roman or Byzantine origin and was supposedly utilized by the folks who lived in the now bulldozed Roman-Byzantine site that was below and immediately to the west of Bab edh-Dhra (Rast and Schaub 1978: 5). The stone facing technique utilized in building the aqueduct, however, is similar to that utilized in building the castle at Kerak. Since the Kerak castle was built by the Crusaders and later modified by the Mamluk Arabs, the aqueduct may be later in age than was previously thought, belonging either to Crusader or Mamluk times. More study of this problem needs to be undertaken, and other aqueducts in the wadis of the southern Ghor must be examined before a measure of certainty can be reached.

Conclusions

The survey located 21 new sites and reexamined a few previously recorded ones. Settlement pattern changes cannot be determined due to the geographically limited nature of the survey. However, the Wadi Kerak alluvial fan appears to have been most intensively utilized during the Paleolithic and EB periods.

The EB sites of B.D.S. no. 19 and 20 may be outlying cemetery areas on the lower fan since most of the ceramics are EB I forms which to date have been recovered only in the cemetery shaft tombs at Bab edh-Dhra. It is felt that B.D.S. no. 4, 5, and 11 represent small outlying EB farmsteads on the upper fan. Modern farmers still plant some portions of the alluvial fan for winter crops. Undoubtedly these EB sites represent a similar type of utilization of the upper fan. B.D.S. no. 14, 17, and 18 may represent farmsteads or working areas on the lower fan. The sherd concentrations are denser on these sites than for those on the upper fan. This may be due to the fact that the lower fan can be easily irrigated from Wadi Kerak and more crops could be planted there. This would necessitate a larger work force to care for these crops and thus a higher artifact density. In any case, it does appear that there were outlying homesteads which helped support the main town of Bab edh-Dhra.

The Paleolithic sites appear to be either flint-knapping workshop sites or small campsites of not more than 30 m diameter. The upper fan would provide a reasonably good overview of the lower Rift Valley area near the Dead Sea. It also provided abundant raw material for chipped stone tools. Most of the sites appear to be surface scatters with little hope of buried stratigraphic levels. The few Lower Paleolithic remains appear to be solitary discards or due to secondary deposition as in the case of B.D.S. no. 3.

The Roman and Byzantine materials are all on sites close to the bulldozed Roman-Byzantine site below Bab edh-Dhra and probably are outlying sites or refuse dumps for this main site.

Hopefully, further work at these sites will better define the utilization of the Kerak alluvial fan through time and better pinpoint the age of the Paleolithic materials recovered there.

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